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ESTABLISHED 1850

The Defiance Machine Works

INVENTORS AND BUILDERS OF

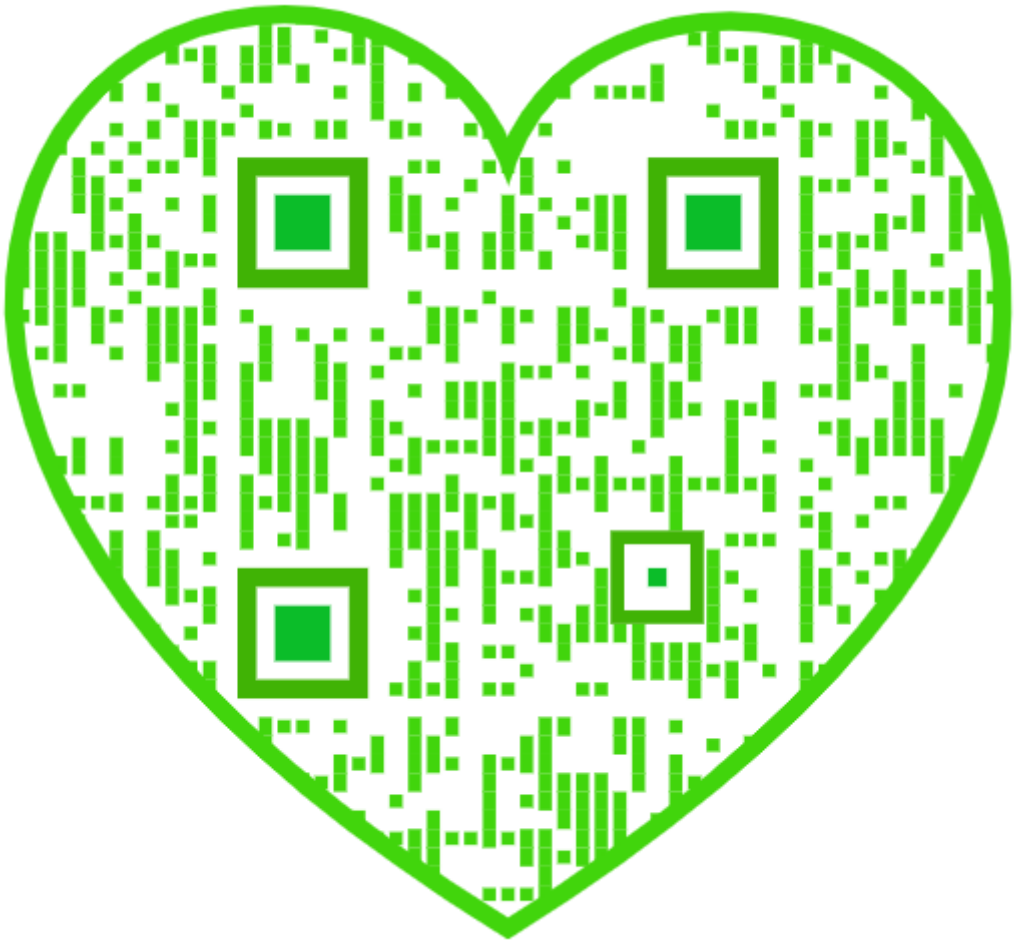
Patent Wood Working Machinery

DEFIANCE ~ OHIO

UNITED STATES OF AMERICA

CATALOGUE

No. 200.



No. 537

WITH COMPLIMENTS OF

THE DEFIANCE MACHINE WORKS

DEFIANCE, OHIO, U. S. A.

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IN ORDERING BY LETTER, MENTION PAGE AND NUMBER.

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I 822 (085)

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Supplement to this Catalogue filed in Box 81.

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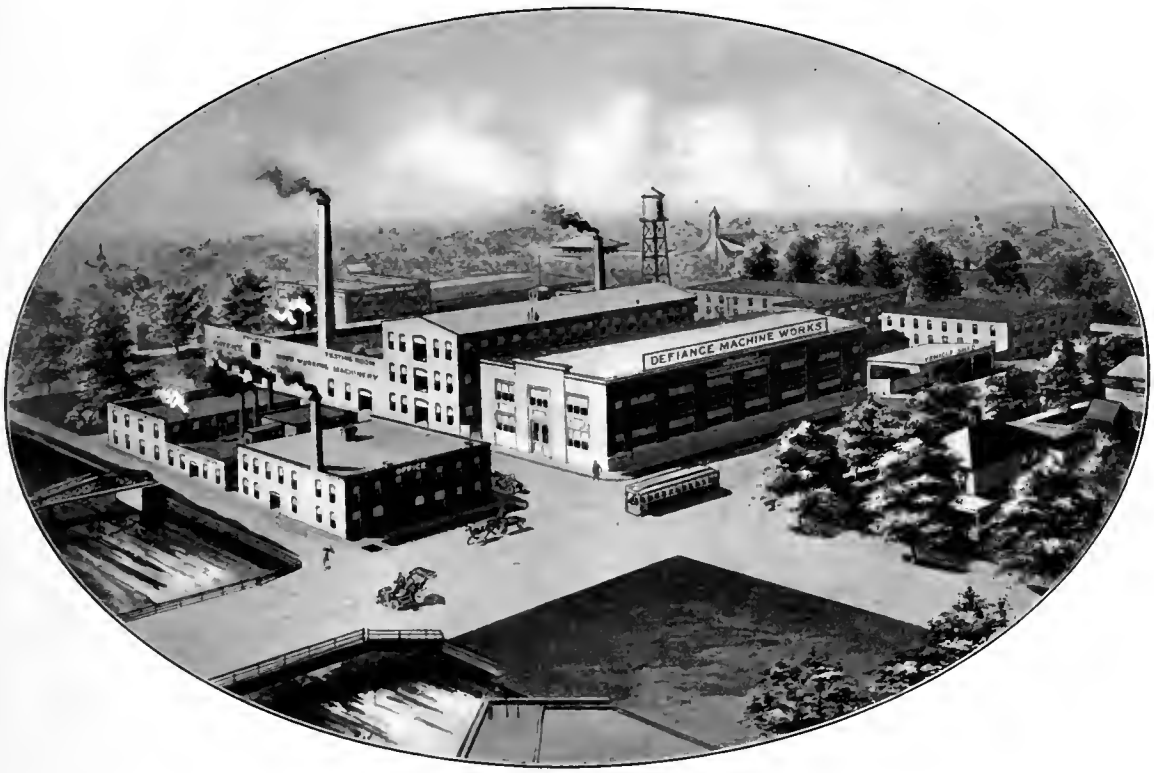
ILLUSTRATED

DESCRIPTIVE CATALOGUE

PATENT LABOR-SAVING

WOOD-WORKING MACHINERY



INVENTED AND MANUFACTURED BY

THE DEFIANCE MACHINE WORKS

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CORNER IN THE PRESIDENT'S OFFICE.

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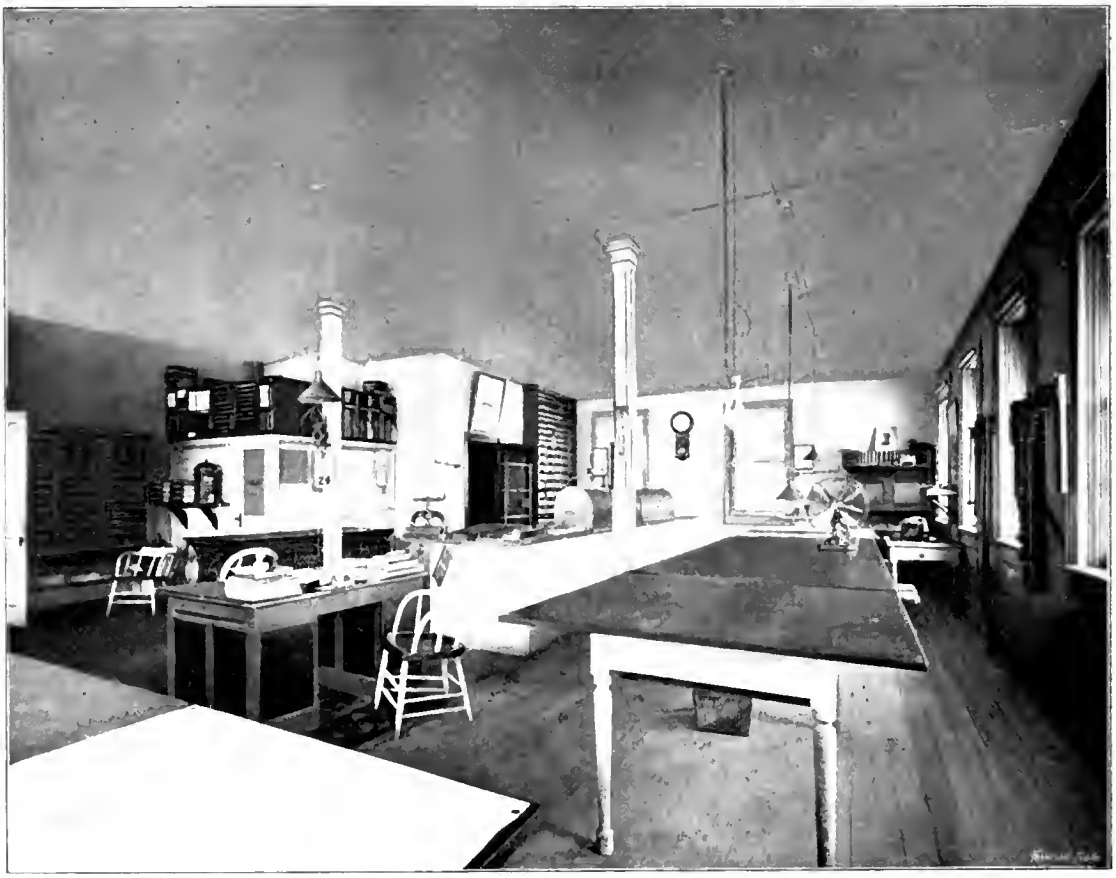
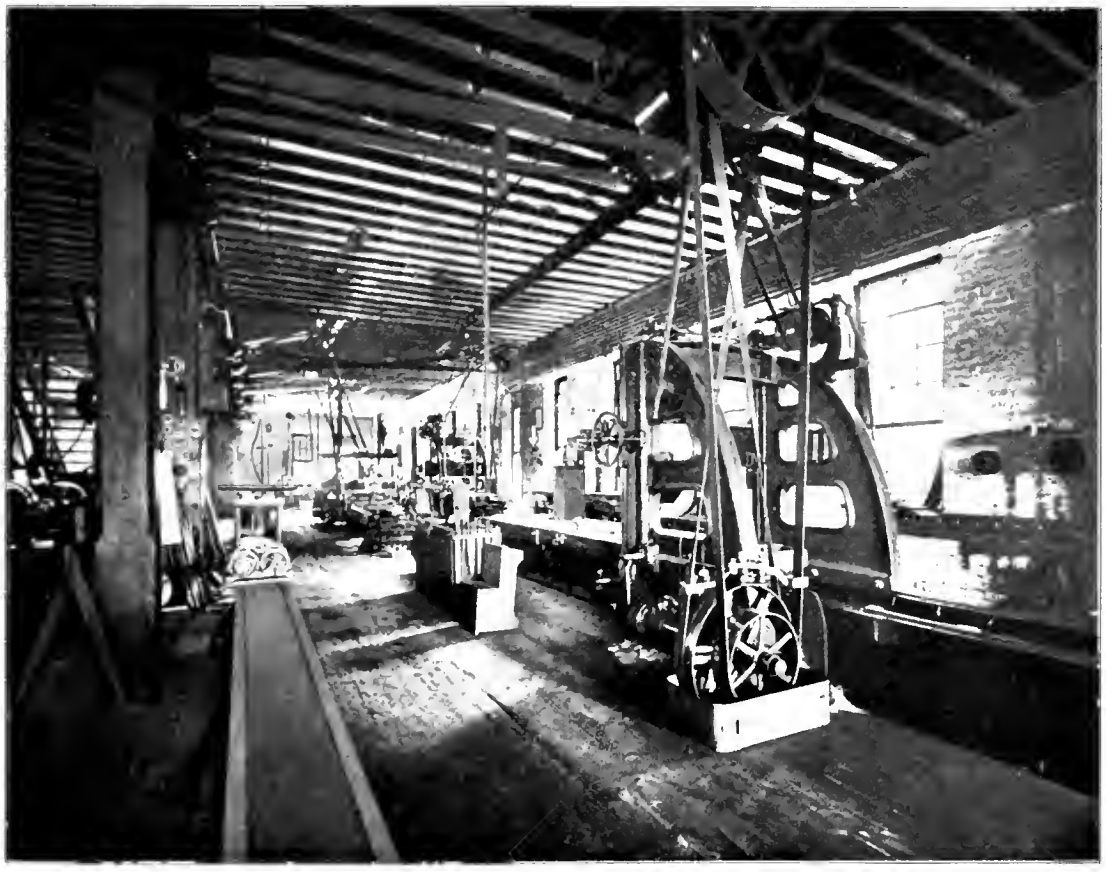
CORNER IN THE BOOKKEEPING DEPARTMENT.

PRIVATE DESIGNING ROOM—ENGINEERING DEPARTMENT.

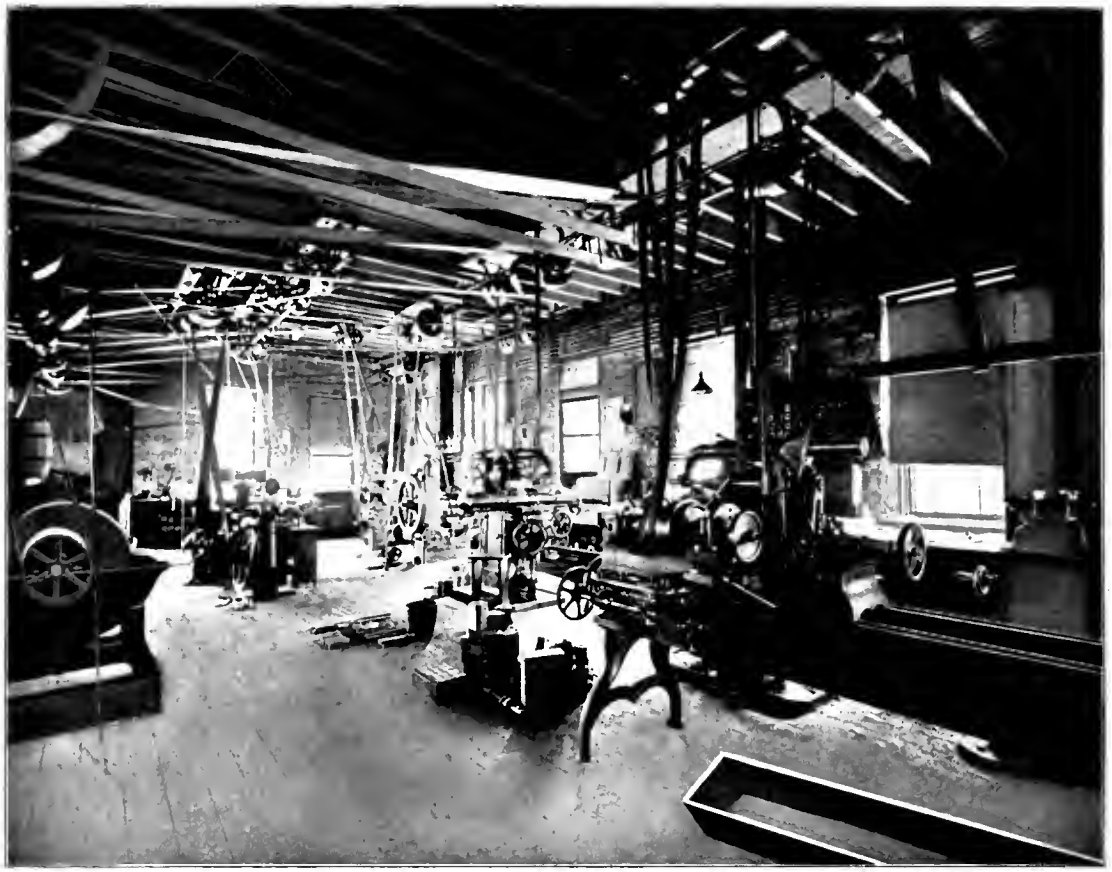


CORNER IN GENERAL DRAWING ROOM—ENGINEERING DEPARTMENT.

FOUNDRY DEPARTMENT—WHERE MACHINE CASTINGS ARE MADE.

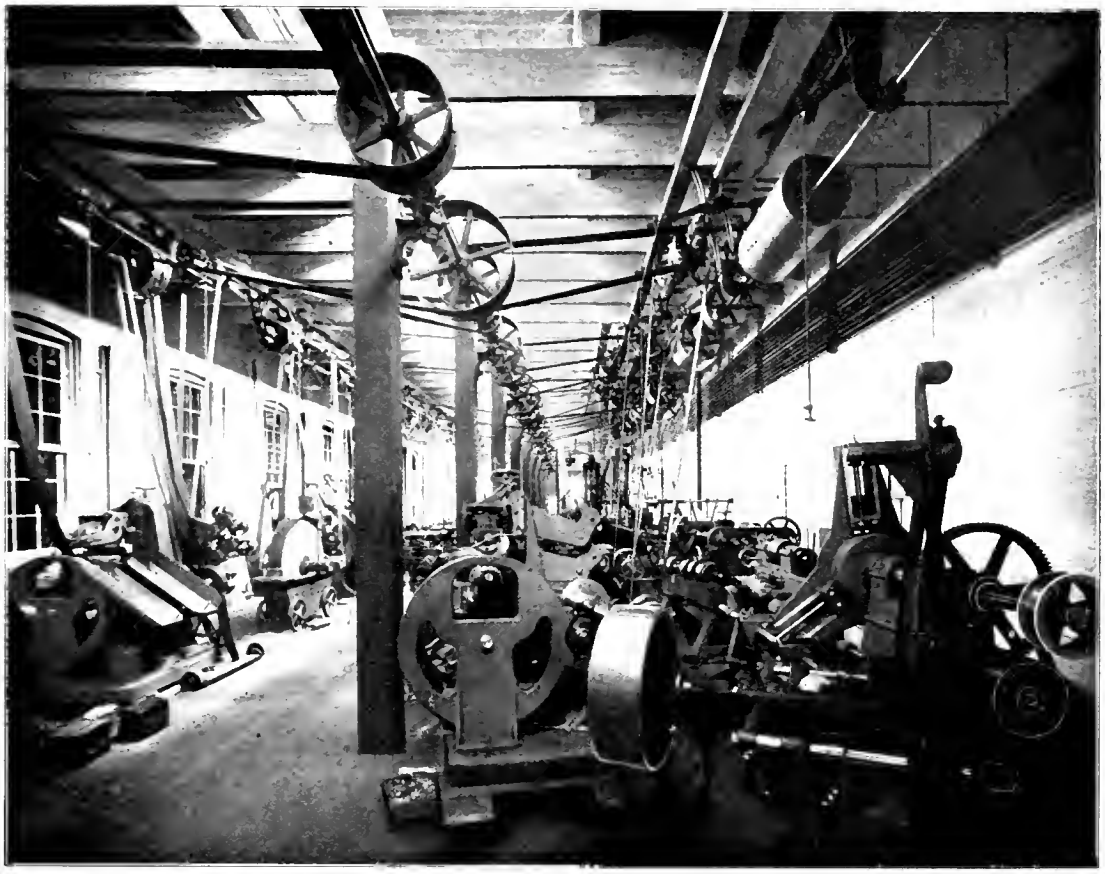


CORNER IN MACHINE SHOP—SHOWING SEVERAL METAL PLANERS.



CORNER IN MACHINE SHOP—GEAR CUTTING DEPARTMENT.

CORNER IN MACHINE SHOP—SHOWING LARGE RADIAL DRILL AND HEAVY PLANER.



TESTING ROOM—WHERE EACH MACHINE IS PUT TO ACTUAL TEST BEFORE SHIPMENT IS MADE.

BOXING OR PACKING DEPARTMENT—WHERE THEY ARE CAREFULLY PREPARED FOR FINAL SHIPMENT.

TO OUR PATRONS AND FRIENDS

IN ALL COUNTRIES,

AND ALL PROGRESSIVE MECHANICS

INTERESTED IN

LABOR-SAVING WOOD-WORKING MACHINERY,

THIS VOLUME IS

RESPECTFULLY DEDICATED.

THE DEFIANCE MACHINE WORKS,

DEFIANCE, OHIO,

UNITED STATES OF AMERICA.

Announcement.

ANY of the Machines illustrated in this Catalogue of Labor-Saving Machinery can be purchased of the undersigned, or their authorized agents. Every Machine is thoroughly tested by skillful mechanics, and the work expected of them accurately performed in our special testing rooms before the Machines are shipped, and when received by the purchaser they are all adjusted and ready for work when the power is applied. Every Machine is guaranteed to perform as represented, and is unsurpassed in the saving of labor.

THE DEFIANCE MACHINE WORKS,

Defiance, Ohio, U. S. A.

Introduction.

IN presenting this, our Illustrated Catalogue No. 200, to our friends and the users of Wood-Working Machinery, we are able and pleased to say that all the machines shown in this volume are of our own manufacture, and constructed from accurate drawings and standard templates. The reputation of our tools for exactness, convenience, elegance, and adaptation to the end sought is the result of a well defined and persevering course, dictated as well by good policy as by sentiments of fair dealing.

Every opportunity for improvement has been accepted, and no device that could add to the usefulness of the tools has been neglected. We guarantee our machines to be superior in labor-saving to any others in the market, and, when equaled by any other make, we at once improve them. The engravings show the machines as constructed at this time. Improvements will be added from time to time.

All the machines shown herein are of sufficient weight to secure strength and durability without clumsiness; they are simple in design, convenient in arrangement of parts, and the parts are all accurately fitted, all racks and gears are strong and well cut, the best form of tooth being employed, with all sliding surfaces scraped to bearing, with boxes lined with genuine babbitt metal or bronze.

Each machine is illustrated and described in detail on the following pages, with information regarding their construction and product; with the aid of this Catalogue parties desiring to purchase Wood-Working Machinery can select intelligibly sets or single machines for use in almost any branch of wood production.

In manufacturing we have spared no expense to increase our facilities, and in designing, improving, and constructing the best methods are adopted, standard sizes being maintained, and the balancing of rotating parts by a special patented machine of our own invention has given the Defiance machines a wide reputation for accuracy of balance to their running parts.

Our shops are equipped with the best machinery and appliances for producing accurate work at least cost; the buildings are heated by steam throughout, and are thoroughly well lighted—by night by an incandescent light plant,—thus enabling men to work to the best advantage.

We are prepared to furnish complete equipments of automobile wheel and body, hub, spoke, wheel, bending, wagon, carriage, plow handle, broom, rake, fork and brush handle, hammer, hatchet, pick and chisel handle, all kinds of spool and bobbin, barrel bung, oval wood dish, billiard ball and cue, golf stick, shoe lasts, neck-yoke, singletree, shaft, pole, and barrel hoop machinery, and a general line of standard and special Wood-Working Machinery, all of which contain many new features of advantage and convenience.

Most of the machines shown herewith are covered by Letters Patent, which we found necessary to secure to protect ourselves against unscrupulous parties who would without this protection copy and use our improvements upon which a vast amount of money and study have been expended. Our prices cover the right to use our machines in any part of the United States.

Our machines have, without being displayed at a single exposition, either at home or abroad, found their way into every market of the world, and we are constantly making shipments to England, Ireland, Scotland, France, Germany, Russia, Africa, Sweden, Norway, Italy, New Zealand, Australia, Japan, South America and Canada, and all well regulated wood-working factories in the United States in this line use our machinery, which are evidences of its superior excellence and appreciation by mechanics throughout the world.

Our designs are all new, our facilities are unexcelled, and by the aid of most complete systems throughout our works, careful attention to business and long experience in this line of work, we hope to maintain the high reputation of our work at home and abroad and merit a continuance of the most generous patronage hitherto received.

THE DEFIANCE MACHINE WORKS,

Defiance, Ohio, U. S. A.

PETER KETTENRING, President.
W. A. KETTENRING, Secretary.
R. P. KETTENRING, General Superintendent.
C. H. KETTENRING, Treasurer.

Suggestions.

When ordering machinery, specify distinctly the articles wanted, and give your full address, town, county, and state.

Remittances may be made either by draft or express; if by draft, it should be made payable to our order, and drawn on New York.

In the absence of instructions, machines will in all cases be understood to require boxing, which will be charged at cost.

Preferred routes of shipment should be plainly designated; otherwise they will be forwarded by the cheapest and most expeditious route.

Insurance and freight contracts will be secured at the lowest possible rates when so desired.

In ordering pulleys, state the diameter, width of face, and exact size of bore wanted, also whether they should have flat or crowning face.

In ordering gearing, the exact diameter, width of face, number of teeth, and size of hole should be given.

When circular saws are wanted, state whether for ripping or cross-cutting, and give diameter, size of hole, gauge and style of tooth desired.

In ordering band saw blades, specify length, width, and what machine they are for, and whether or not they should be filed, set, and brazed.

In ordering auger bits, state the diameter and length of twist and shank, respectively.

In ordering hub reaming and boring tools, if tapering blades are required give diameter of each end of blade, length between the diameters, also diameter and length of shank. Drawings showing the size and shapes of reamers when ordering are preferred.

In ordering hub lathe knives, send sample hub, or correct drawings, otherwise the work cannot be executed.

Hub lathe mandrels cannot be furnished unless drawings showing the size and taper of holes in hubs to be turned are furnished, or sample hubs with proper sized holes will answer.

In ordering chisels for our make of mortising machines, give width of blade and number of machine on which they are to be used.

Rules for Ascertaining the Speed of Pulleys.

To find the speed of a countershaft, if the revolutions of the main shaft and size of pulleys are given: Multiply the revolutions of the main shaft by the diameter in inches of the pulley, and divide by the diameter in inches of the pulley on the countershaft. The quotient will be the number of revolutions.

EXAMPLE.—What will be the speed of a countershaft with a 12″ pulley driven by a 30″ pulley 180 revolutions per minute? 180×30÷12=450.

To find the size of a pulley required, if the number of revolutions and size of pulley on the main shaft are given: Multiply the diameter in inches of driving pulley by the revolutions of the main shaft, and divide by the speed required. The quotient will be the diameter in inches of the pulley.

EXAMPLE.—What will be the diameter of a pulley to make a countershaft turn 450 revolutions per minute, driven by a 30″ pulley 180 revolutions per minute? 180×30÷450=12″ pulley.

To find the size of pulley for a main shaft, if the speed of shafts and diameter of pulley on the countershaft are given: Multiply the diameter in inches of pulley by speed of countershaft, and divide by the revolutions of the main shaft. The quotient will be the diameter of the pulley.

EXAMPLE.—What will be the diameter of a pulley on a main shaft making 180 revolutions per minute to drive a 12″ pulley 450 revolutions per minute? 450×12÷180=30″ pulley.

Power of Belting.

Horse power of a belt equals velocity in feet per minute multiplied by the width, the sum divided by 1,000.

One inch single belt, moving at 1,000 feet per minute=1 horse power.

Double belts, about 700 feet per minute, per 1″ width=1 horse power.

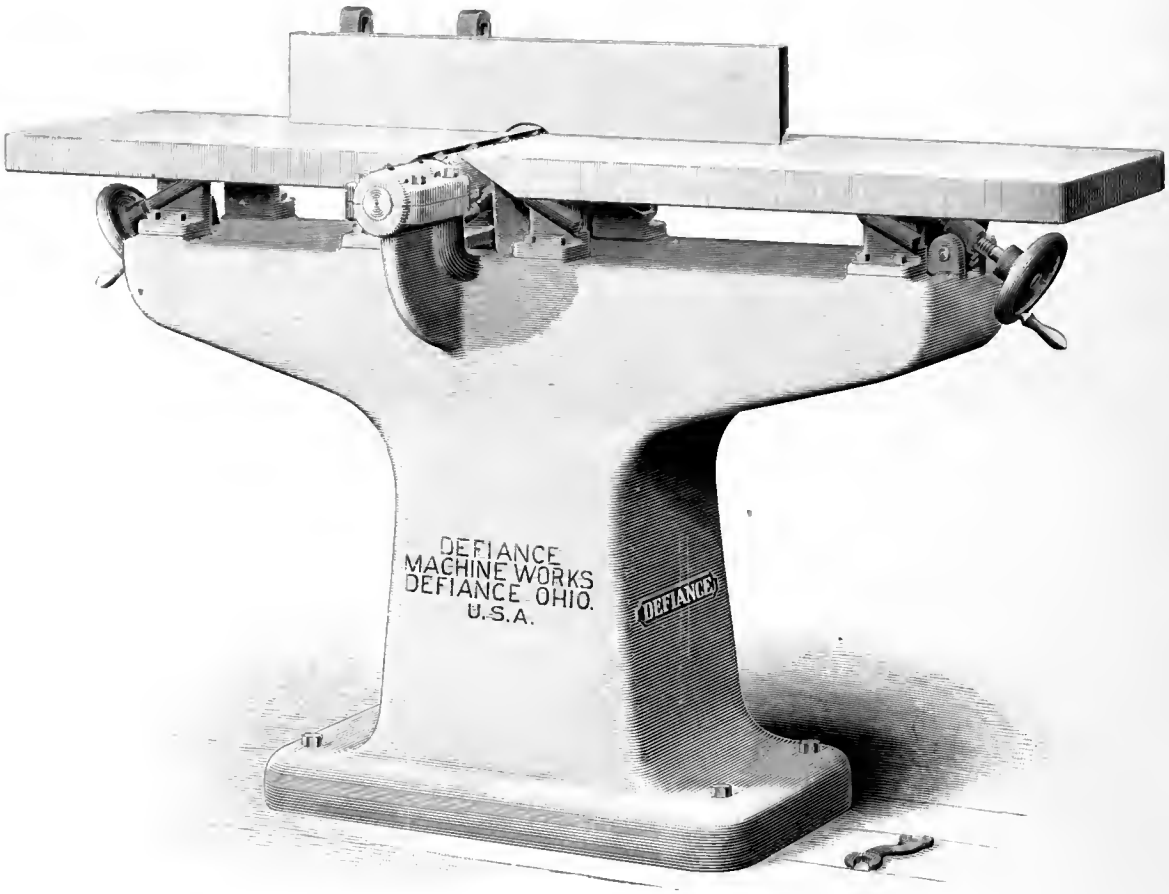
For double belts of great length, over large pulleys, allow about 500 feet per minute per 1 inch of width per horse power.

Power should be communicated through the lower running side of a belt; the upper side to carry the slack.

Average breaking weight of a belt, $\frac{3}{16}$×1″ wide, leather, 530 lbs.; 3-ply rubber, 600 lbs.

Table of Speed of Circular Saws.

Size of Saw.	Revolutions per Minute.	Size of Saw.	Revolutions per Minute.
Inches.	Speed.	Inches.	Speed.
8	4,500	42	870
10	3,600	44	840
12	3,000	46	800
14	2,585	48	750
16	2,222	50	725
18	2,000	52	700
20	1,800	54	675
22	1,636	56	650
24	1,500	58	625
26	1,384	60	600
28	1,285	62	575
30	1,200	64	550
32	1,120	66	545
34	1,050	68	529
36	1,000	70	514
38	950	72	500
40	900		



12″ Hand-Feed Planing and Jointing Machine.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 44 Feet.

Cable Word, PELICAN.

12″ Hand-Feed Planing and Jointing Machine.

Export Shipping Weight, 1,400 Pounds.
Net Weight, 1,000 Pounds.
Cubic Measurement, 44 Feet.
Cable Word, PELICAN.

THIS ENGRAVING represents our new 12″ Hand-Feed Planing and Jointing Machine, which has been designed for straight planing, squaring up, taking out of wind, cornering, beveling and making glue jointings. It will do this work accurately and at an immense saving over hand labor.

THE FRAME is cast in one piece, with cored center, making it very stiff and reliable to properly support the working parts and keep them in perfect alignment.

THE TABLES are planed true and measure 62″ over all, a desirable size for accurate planing, and they are raised and lowered in V slides with adjustment for wear. A hand wheel and screw at either end of the machine are used for adjusting the tables to regulate the depth of cut at all positions keeping outside the radius of the cutting line of the knives.

THE CYLINDER, of forged steel, is of the latest round safety type, carrying three knives made of special high speed steel. It is accurately balanced, with its journals ground true, and they rotate in genuine babbitt metal self-lubricating bearings, which are enclosed to prevent the admission of dust or dirt.

THE BEVELING FENCE can be adjusted over the whole surface of the table to any angle or bevel while the machine is in motion.

THE SHAVINGS from the cylinder are discharged at the rear of the machine through a chamber cored through the frame, always delivering them in one place and never throwing them promiscuously over the floor or inside the frame. A blower pipe can be attached to the mouth of the opening if desired.

THE COUNTER is furnished as follows: Shaft, 44″ × 1 1/16″; two No. 1 Ball and Socket Adjustable Drop Hangers; one driving pulley, 20″ × 3½″; tight and loose pulleys, 10″ × 5″; speed, 950 revolutions per minute; with the loose pulley fitted with bronze bearings which are self-lubricating.

HORSE POWER to drive, 3; floor space occupied, 65″ × 24″.

12″ Combination Hand-Feed Planing and Boring Machine.

Export Shipping Weight, 1,475 Pounds.
Net Weight, 1,075 Pounds.
Cubic Measurement, 45 Feet.
Cable Word, PRINCESS.

12″ Combination Hand-Feed Planing and Boring Machine.

Export Shipping Weight, 1,475 Pounds.
Net Weight, 1,075 Pounds.
Cubic Measurement, 45 Feet.
Cable Word, PRINCESS.

THIS ENGRAVING represents our 12″ Combination Hand-Feed Planing and Boring Machine, which will be found a very useful tool for woodworkers in general, as it can be used for straight planing, squaring up, taking out of wind, cornering, beveling, making glue jointings and general boring.

THE FRAME, of neat design, is cast in one piece, with cored center, making it strong and durable to properly support the working parts, and with a broad floor base to stand firm.

THE TABLES are 62″ long over all, 12″ wide, and they are fitted to the frame in angle ways with adjustment for wear, and adjustable up or down by a convenient hand wheel at each end of the machine to regulate the depth of cut. The throat at the end of the tables around the cutter head always keeps outside the radius of the cutting line of the knives.

THE CUTTER HEAD, of forged steel, is of the latest round safety type, carrying three knives made of high speed steel, it is accurately balanced, with its journals ground perfectly true, and they rotate in long genuine babbitt metal self-lubricating bearings, which are enclosed to prevent the admission of dust or dirt.

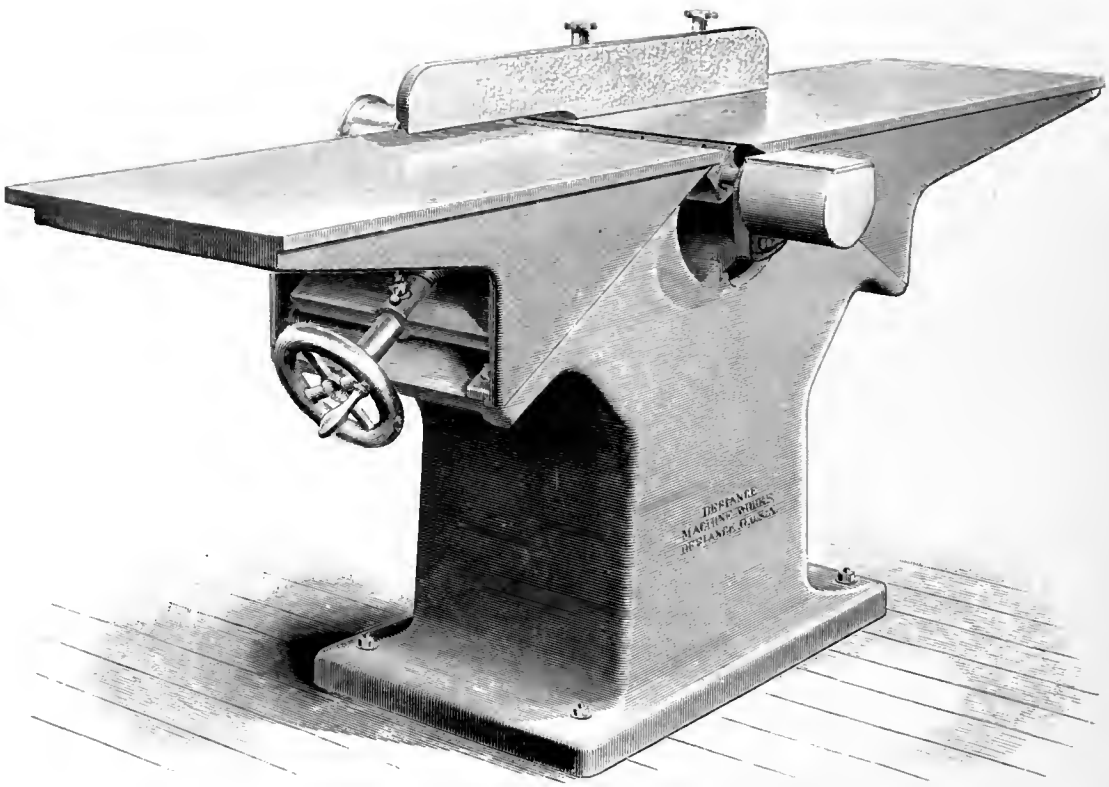
THE BEVELING FENCE can be quickly adjusted over the face of the table or to any angle and quickly locked in position by a single handle lever.

THE SHAVINGS from the cylinder are discharged through a cored opening in the frame to the rear of the machine and not scattered over the floor promiscuously. A blower pipe can be attached to the opening if desired.

THE BORING ATTACHMENT is adjustable vertically by hand screw for different thicknesses of material and has a sliding horizontal movement of 8″ to or from the boring bit. The table, of iron, planed true is fitted with an adjustable gauge that can be set to any angle desired for angle boring.

THE COUNTER is furnished as follows: Shaft, 44″ × 1 1/16″; two No. 1 Adjustable Drop Hangers; one driving pulley, 20″ × 3½″; one pair of tight and loose pulleys, 10″ × 5″; speed, 960 rotations per minute. The loose pulley is fitted with bronze bearings and is self-lubrieating.

HORSE POWER to drive, 3; floor space occupied, 65″ × 48″.



16″ Hand-Feed Planing and Jointing Machine.

Export Shipping Weight, 2,000 Pounds.

Net Weight, 1,500 Pounds.

Cubic Measurement, 70 Feet.

Cable Word, POTASH.

16″ Hand-Feed Planing and Jointing Machine.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,500 Pounds.
Cubic Measurement, 70 Feet.
Cable Word, POTASH.

THE 16″ HAND-FEED PLANING AND JOINTING MACHINE, as shown by the engraving, is in general use by leading wood-working shops throughout the world. It is adapted to a wide range of uses and performs the work in a superior manner, more accurately and effecting an immense saving over hand labor, and it is recommended for straight planing, squaring up, taking out of wind, cornering, chamfering, beveling, and making glue jointings. It is suited to all the general requirements of sash, door, furniture, pattern, car, wagon, carriage, and agricultural implement manufacturers.

THE CYLINDER is made of forged steel, including its journals, and is of the latest round safety type, carrying three knives made of high speed steel; it is 16″ wide; the machine is of modern design, strong, well supported, positive and easy of adjustment, with heavy bearings and true surfaces.

THE FRAME is heavy and substantial, cast in one piece, very stiff and durable, properly supporting the tables and keeping them in alignment.

CHIPS AND DUST from the cylinder are discharged at the back end of the machine through a chamber cored through the frame. The mouth of the opening is tapped and furnished with screws to form connection with exhaust pipe; thus the chips are not miscellaneously thrown over the floor or delivered at an inconvenient position inside the frame.

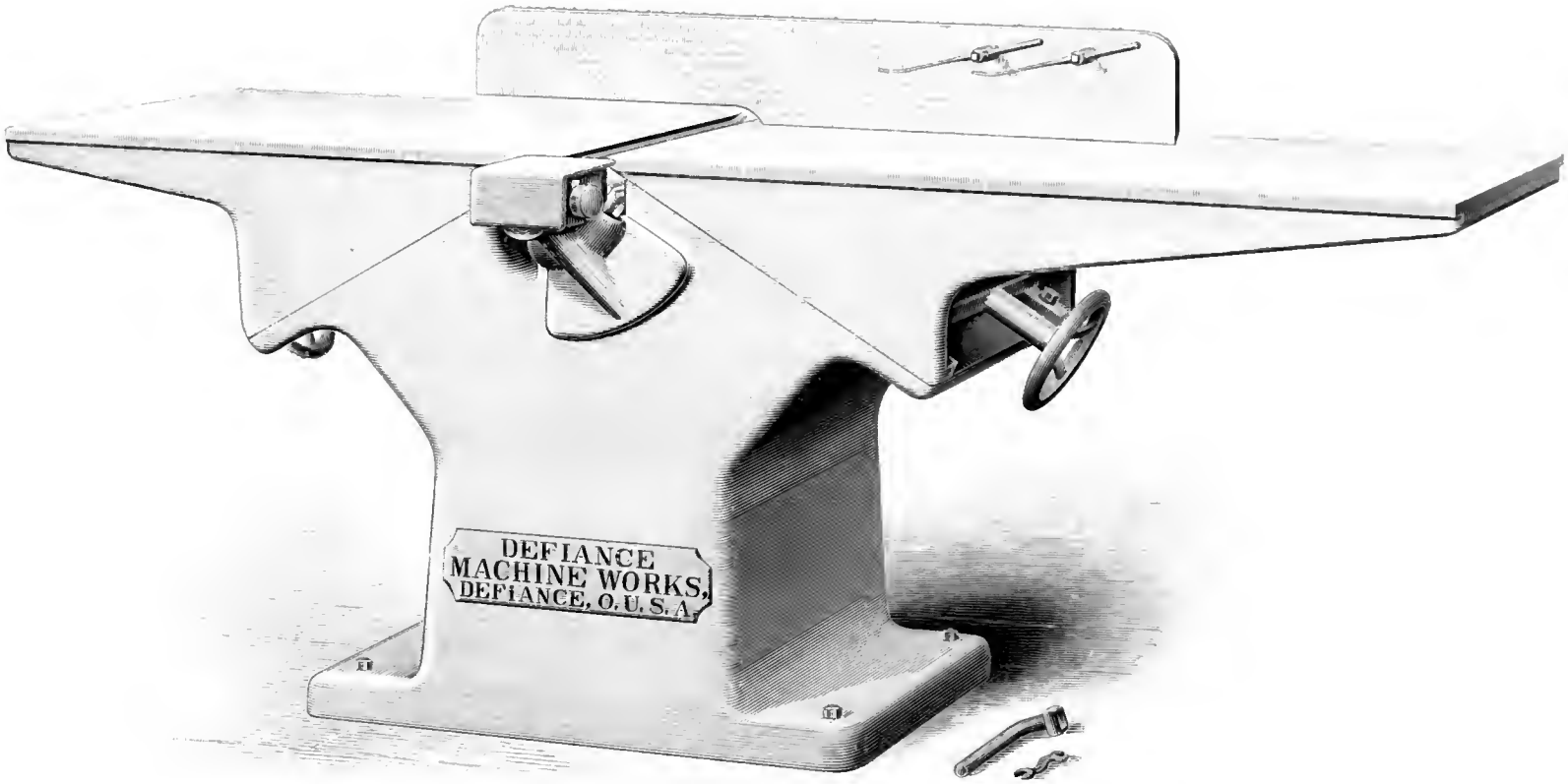
THE TABLES measure 7 feet from out to out, an exceedingly desirable length for fine planing. They are fitted to the frame and slide in planed and scraped angular ways and are provided with gibs to take up for wear. A hand wheel and screw at either end of the machine are used for adjusting the tables horizontally, to regulate the depth of cut. The end of tables at throat form an opening $1\frac{3}{4}$″ wide when the machine is set for ordinary planing, at all positions keeping outside the radius of the cutting line of the knives. A finishing cut is removed from the top surface and sides of the table after they are fitted to the frame, making them absolutely true and parallel with each other.

THE JOURNAL BOXES are lined with genuine babbitt metal, supplied with cups and self-oiling chambers. A shield surrounds the boxes, preventing the admission of dust to the bearings and the operator from coming in contact with the oil.

AN IMPROVED ADJUSTABLE FENCE accompanies each machine, which is adjustable over the whole surface of the table, and can be instantly set at any angle while the machine is in motion.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$″×40″; tight and loose pulleys, 10″×5″; driver, 20″×4″; speed, 1,000 rotations per minute; pulley on cutter head spindle, 4″×4″; speed, 5,000 rotations per minute.

HORSE POWER to drive, 4; floor space occupied, 28″×84″.



24″ Hand-Feed Planing and Jointing Machine.

Export Shipping Weight, 2,600 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 88 Feet.

Cable Word, PLATED.

24″ Hand-Feed Planing and Jointing Machine.

Export Shipping Weight, 2,600 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 88 Feet.

Cable Word, PLATED.

THE 24″ HAND-FEED PLANING AND JOINTING MACHINE, as shown by the engraving, is in general use by the leading wood-working shops throughout the world. It is adapted to a wide range of uses and performs the work in a superior manner, more accurately, and effecting an immense saving over hand labor; and it is recommended for straight planing, squaring up, taking out of wind, cornering, chamfering, beveling, and making glue joints. It is suited to all the general requirements of sash, door, furniture, pattern, car, wagon, carriage, and agricultural implement manufacturers.

THE CYLINDER is made of forged steel, including its journals, and is of the latest round safety type, carrying three knives made of special high speed steel; it is 24″ wide; the machine is of modern design, strong, well supported, positive and easy of adjustment, with heavy bearings and true surfaces.

THE FRAME is heavy and substantial, cast in one piece, very stiff and durable, properly supporting the tables and keeping them in alignment. Having no projection at working side at the base, the portion of the floor occupied by the operator is entirely disencumbered.

CHIPS AND DUST from the cylinder are discharged at the back end of the machine through a chamber cored through the frame. The mouth of the opening is tapped and furnished with screws to form connection with exhaust pipe; thus the chips are not miscellaneously thrown over the floor or delivered at an inconvenient position inside the frame.

THE TABLES measure 7 feet from out to out, an exceedingly desirable length for fine planing. They are fitted to the frame and slide in planed and scraped angular ways; are provided with gibs to take up for wear. A hand wheel and screw at either end of the machine are used for adjusting the tables horizontally, to regulate the depth of cut. The end of tables at throat form an opening 1¾″ wide when the machine is set for ordinary planing, at all positions keeping outside the radius of the cutting line of the knives. A finishing cut is removed from the top surface and sides of the tables after they are fitted to the frame, making them absolutely true and parallel with each other.

THE JOURNAL BOXES are lined with genuine babbitt metal, supplied with cups and self-oiling chambers. A shield surrounds the boxes, preventing the admission of dust to the bearings and the operator from coming in contact with the oil.

AN IMPROVED ADJUSTABLE FENCE accompanies each machine, which is adjustable over the whole surface of the table, and can be instantly set at an angle while the machine is in motion.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 40''$; tight and loose pulleys, $10'' \times 5''$; driver, $20'' \times 4''$; speed, 1,000 rotations per minute; pulley on cutter head spindle, $4'' \times 4''$; speed, 5,000 rotations per minute.

HORSE POWER to drive, 4½; floor space occupied, $36'' \times 84''$.

24″ Patent Four Roll Single Surface Planer.

Export Shipping Weight, 2,450 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 63 Feet.

Cable Word, PATHFINDER.

24″ Patent Four Roll Single Surface Planer.

Export Shipping Weight, 2,450 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 63 Feet.
Cable Word, PATHFINDER.

THIS ENGRAVING represents our new 24″ Patent Four Roll Single Surface Planer, designed for accurately planing hard or soft wood up to 24″ wide and narrower and from $\frac{1}{16}$″ to 6½″ thick. It is accurately constructed in every detail and it will fully meet the requirements of the most exacting woodworker, and it is recommended to furniture and piano manufacturers, pattern makers and others requiring smooth and true work.

THE FRAME is a single casting of sufficient strength to properly support the working parts and to overcome all tendency to spring or chatter.

THE TABLE, in one piece, is gibbed to the frame at the four corners and supported in the center at either side upon two heavy steel screws, which overcome the liability of springing or sagging when the machine is doing its heaviest work, and it is raised and lowered to an indicator for determining the exact thickness of material to be planed by a convenient hand wheel, which is out of the way.

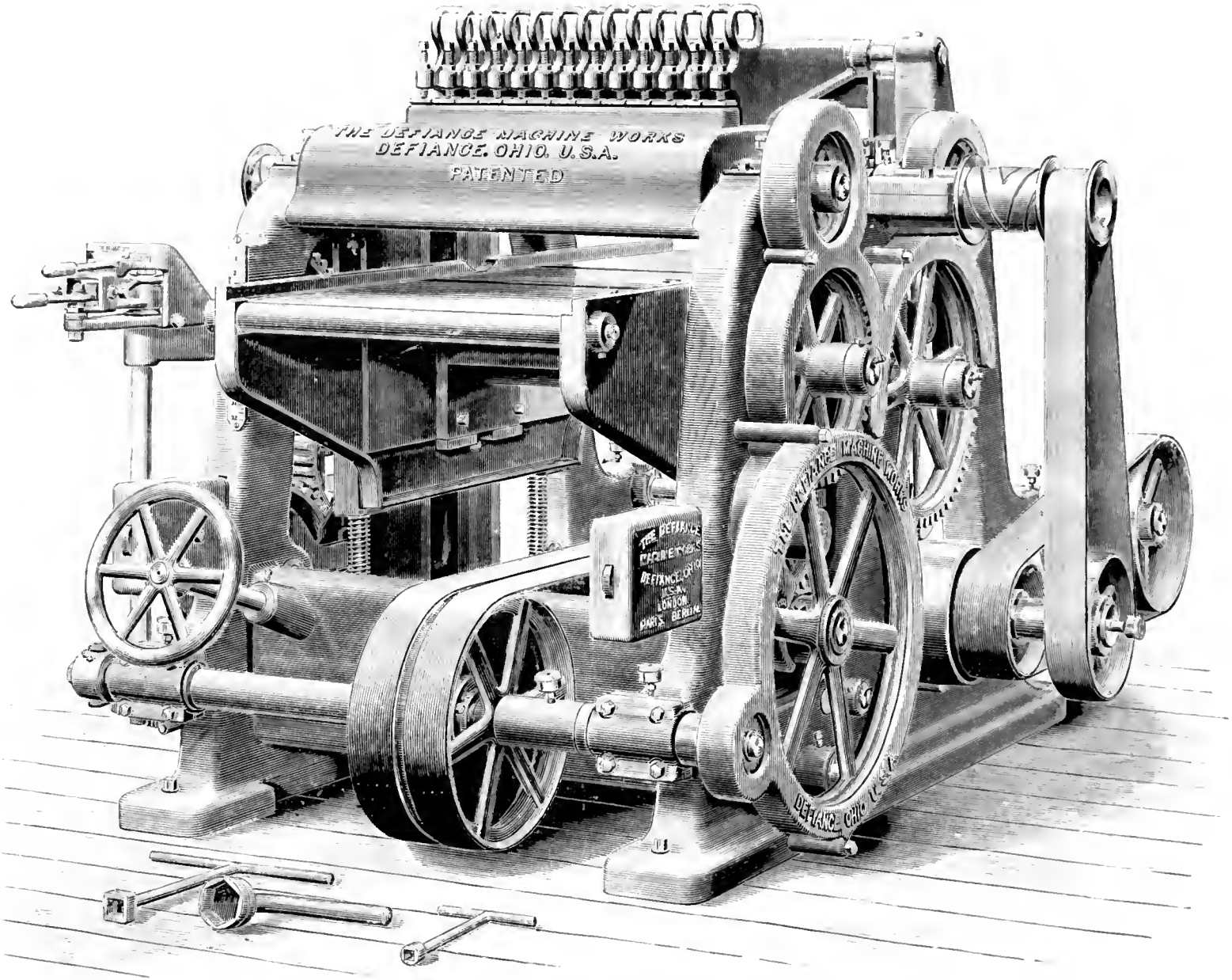
THE CYLINDER, of forged steel, is of the three knife type, is accurately balanced, with its journals ground perfectly true, and they run in long genuine babbitt metal self-lubricating bearings, and it is driven by a single 6″ belt.

THE FEED is driven from the cutter head spindle. It can be instantly arrested while the machine is in motion by a single movement of a convenient hand lever. Four large feed rolls are employed. Those in the table are mounted in milled seats with means for quick adjustment, while the upper rolls are controlled by compression springs with means for adjustment of tension. All gears and parts are heavy and well supported.

IT IS in every detail the handiest and most complete small size planer offered, giving free access to the cylinder and cutters by simply raising the hood. The method of lubrication is most complete.

THE COUNTER is furnished as follows: Shaft, 44″ × $1\frac{11}{16}$″; one pair No. 2 Ball and Socket Adjustable Drop Hangers, fitted with improved belt shipping apparatus; one driving pulley, 24″ × 6″; one pair tight and loose pulleys, 10″ × 6″; speed, 800 rotations per minute. The loose pulley is fitted with bronze bearings and is self-lubricating.

HORSE POWER to drive, 5; floor space occupied, 36″ × 54″.



26″ Patent Four Roll Single Surface Planer.

Export Shipping Weight, 8,000 Pounds.
Net Weight, 7,200 Pounds.
Cubic Measurement, 219 Feet.

26″ Patent Four Roll Single Surface Planer.

Export Shipping Weight, 8,000 Pounds.
Net Weight, 7,200 Pounds.
Cubic Measurement, 219 Feet.
Cable Word, PHŒNIX.

THIS ENGRAVING represents our new 26″ Patent Four Roll Single Surface Planer, which contains many patented improvements. It is simple and substantial, and accurately constructed in every detail. It is capable of planing hard or soft wood perfectly smooth, filling every requirement of the most exacting woodworker, performing very fine smooth planing such as required by furniture, piano, and other similar manufacturers, and it is equally capable of handling heavy work where deep cutting on a coarse feed is required. It will plane material up to 26″ wide and anything narrower up to 12″ in thickness, and anything under, making an exceedingly fine machine for the use of wagon, agricultural implement, railway car, and ship builders' use.

IT POSSESSES every convenience of operation, is a thoroughly durable machine, and unusually well adapted to rapid and accurate work. It is made from new patterns, improved and extra heavy, care having been taken to secure, in every way, a stiff and reliable machine.

THE FRAME, of new design, is a massive casting with cored center, and of sufficient weight to stand firm without fastening to the floor. The bottom is planed true, so that the machine will have a uniform bearing on the floor or foundation.

THE CUTTER HEAD CYLINDER and heavy journals are made of solid forged steel in one piece; it is triangular in form, fitted with three knives and lipped for cross-grained or knotty lumber, and it runs in patent ring-oiling bearings $2\frac{3}{16}$″ diameter, 12″ in length, which are automatically lubricated. The pulleys for driving the cylinder are at each end. They are our patent pneumatic type, with 6″ faces, and they are fitted to the cylinder journals on a taper bearing, avoiding the use of set screws or keys.

THE CHIP BREAKERS move in a true circle with the cutters in order to remain the same distance from the knives when taking a light or heavy cut, which is a most essential feature for smooth planing, and they are hinged at their rear end, so that they can be lifted back out of the way, giving free access to the knives when resharpening is necessary.

THE TABLE is supported upon four heavy steel screws and fitted to the inside of the frame in broad guide ways on either side, and it is raised and lowered by power, a slight movement of a single convenient hand lever controlling it. By this device the table can be quickly raised or lowered to a scale on the frame of the machine for any thickness of planing. By an ingenious device, the movement of the table is automatically arrested at its extreme up or down movements, which prevents any possible chance of cramping the table when going up or down to its full limit.

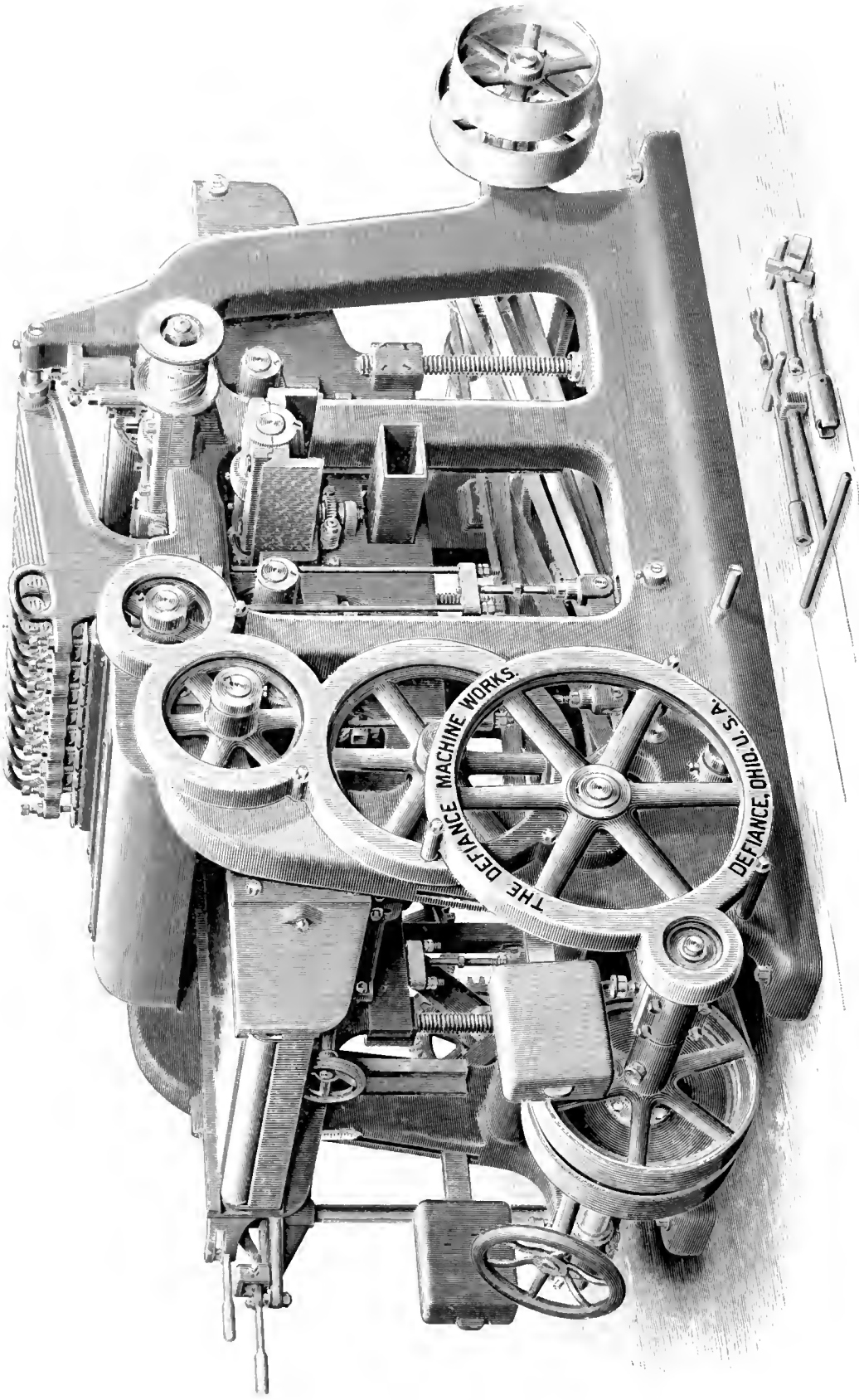
OUR PATENT FEED consists of four power-driven rolls, two above and two in the table. They are all rotated by cut gearing, cut from the solid, which produces a uniform and steady movement to the feed free from back lash or chatter as with the ordinary cast gearing. Consequently, smooth and perfect planing can be secured. The front upper feed roll is constructed of 2″ roller sections, which enables a number of strips or boards of uneven thickness to be fed through the machine at one and the same time, and reduced to equal dimensions.

THE FEED, which is very powerful, has four changes of speed to suit the different kinds of work. By our new friction device, which is controlled by a single hand lever, the rate of feed can be changed from fast to slow while the machine is in motion, or it can be instantly arrested. All of these adjustments are made from the working side of the machine, so that the operator is not obliged to leave his position in adjusting the machine for the various classes and sizes of work. All the journals and wearing surfaces are provided with self-oiling devices, and so inclosed to prevent the admission of dust or dirt. The lubrication of this planer has been given special attention. All the oil reservoirs are bored from the solid, which prevents the working of core sand into the bearings.

A SHAVING CHUTE is provided for delivering the shavings to any of the modern forms of exhaust pipe systems, and when not so connected a deflector is furnished to the shaving chute, which causes them to fall immediately back of the machine.

THE COUNTER furnished with this machine consists of a shaft $2\frac{3}{16}$″ × 8 feet long, with three No. 3 ball and socket adjustable self-oiling drop hangers, with new style belt shipping apparatus, attached; two driving pulleys, 26″ × 5½″; one pair of tight and loose pulleys, 14″ × 6″, with the loose pulley fitted with bronze bearings and self-oiling devices; speed, 800 turns per minute. They can be belted to from above or below or either side.

HORSE POWER to drive, 10; floor space occupied, 70″ × 84″.



26″ Patent Six-Roll Double Surface Planer.

Export Shipping Weight, 11,000 Pounds.
Net Weight, 10,000 Pounds.
Cubic Measurement, 272 Feet
Cable Word, PLUMRIC.

26″ Patent Six-Roll Double Surface Planer.

Export Shipping Weight, 11,000 Pounds.
Net Weight, 10,000 Pounds.
Cubic Measurement, 272 Feet.
Cable Word, PLUMRIC.

THIS ENGRAVING represents our 26″ Patent Six-Roll Double Surface Planer, of new and original design, which contains many new patented features for convenience in adjustment, and the accuracy of its operation. It will plane, at one time, both sides of either hard or soft wood, and reduce the surface to a smooth, satin-like finish. It is, therefore, a great labor-saving device when used on work requiring a high polish, such as used by the makers of furniture, pianos, and interior woodwork. It is equally capable of handling heavy work where deep cutting on a coarse feed is required. Its capacity is sufficient to plane up to 26″ wide, and any size narrower up to 12″ thick, down to the thinnest panel, and it is highly recommended for the use of wagon, agricultural implement, railway car, and ship builders use.

THE FRAME is a massive casting of new design and of pleasing lines, with cored center and a wide floor base of sufficient weight to properly support the working parts and overcome all tendency to spring or jar.

THE CUTTER HEADS are made from solid crucible steel forgings, three-wing construction, each fitted with three knives and lipped for cross-grained or knotty lumber. The journals run in patent ring-oiling bearings $2\frac{3}{16}$″ diameter, 12″ long, which are automatically lubricated; with a patent pneumatic driving pulley at each end, with 5″ face, for the upper head, and 6″ for the lower, and they are fitted to the journals on taper bearings, avoiding the use of set screws or keys.

BOTH CUTTER HEADS are driven from a countershaft attached to the ceiling, which is provided with a special belt tightener so constructed to automatically secure the proper tension to the belt for the lower head, when raising and lowering the table; thus the floor space around the machine is entirely disencumbered, and the counter and pulleys are up out of the way. The lower cutter head, with its bearings, can be quickly removed from the machine, giving free access for the sharpening and setting of the knives. A gauge is furnished to accurately set the cutters from the center of the cutter head. By turning a single wrench the lower head can be adjusted up or down to regulate the depth of cut, or either end of the cutter head may be raised or lowered by the same wrench, and, by the use of an auxiliary bed attached to and forming a part of the main table, the cut of the lower head can be changed while the machine is in motion.

THE LOWER CUTTER HEAD is placed 4″ in advance of the upper one for the purpose of securing a true surface on the bottom of the material before the upper head commences to cut, which reduces all uneven surfaces and twists from the under surface of the material, thus providing a true line to which the upper surface is planed.

THE CHIP BREAKERS move in a true circle with the cutters, remaining the same distance from the knives when taking a light or heavy cut, a most essential feature for smooth planing, and they are hinged at the rear, and can be lifted back out of the way, giving free access to the upper head.

SHAVING CHUTES are fitted to each head to which can be easily attached a conveyor pipe of an exhauster.

THE TABLE is supported upon four heavy steel screws and fitted to the side of the frame at each corner, in broad guide ways, and it is raised and lowered by power, a slight movement of a single convenient hand lever controlling it, raising or lowering it accurately to a scale on the frame for different thicknesses of planing.

THE PATENT FEED consists of six large power-driven rolls, three above and three in the table, and they are rotated by gearing cut from the solid, which produces a perfectly steady motion, free from back-lash or chatter, which enables the machine to produce perfectly smooth planing.

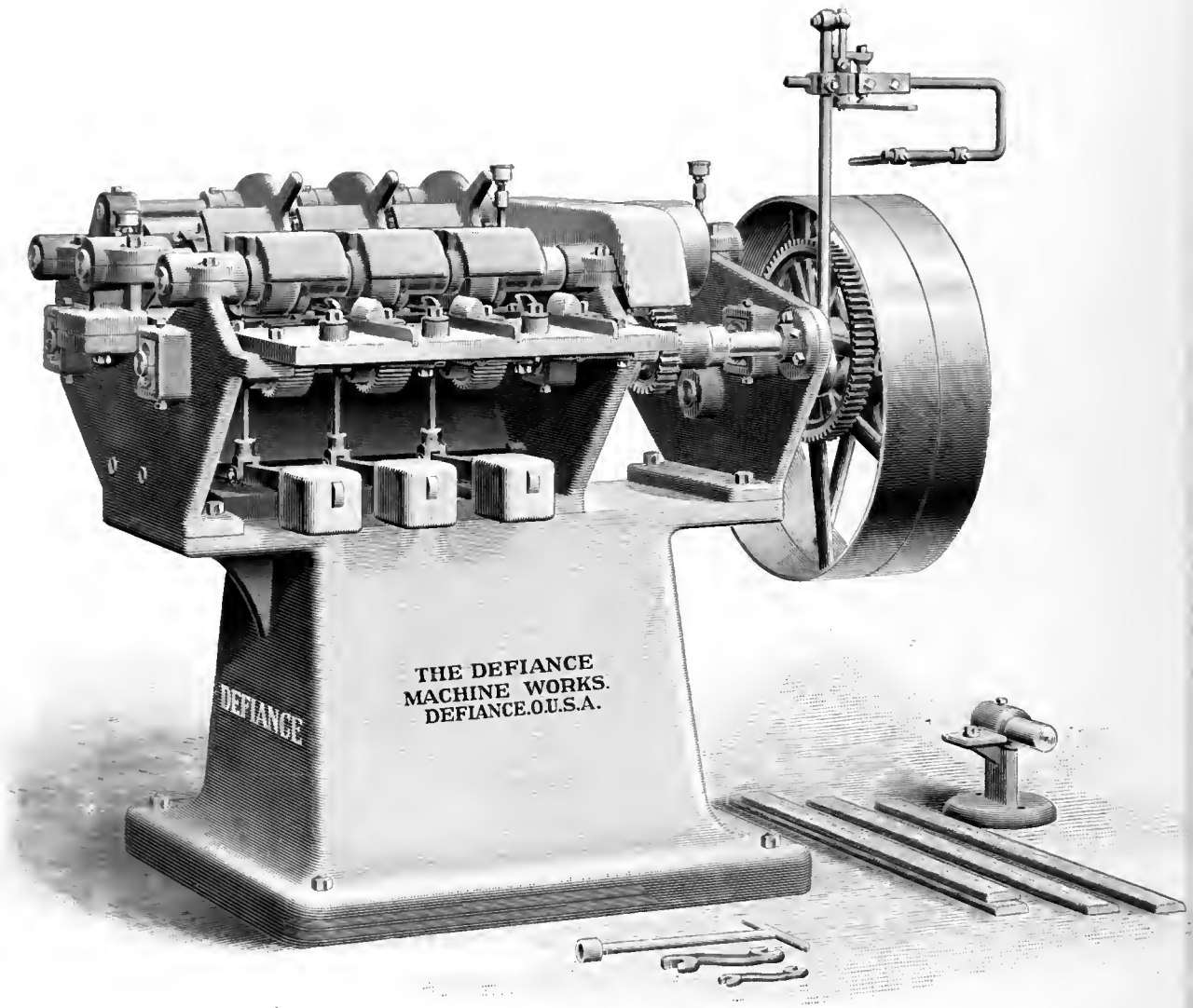
THE FRONT UPPER FEED ROLL is constructed of roller sections, which enables a number of strips or boards of uneven thickness to be fed through the machine at one and the same time, and reduced to equal dimensions.

THE FEED, which is very powerful, has four changes of speed, 40, 50, 60, and 70 feet per minute, to suit the different kinds of work. It can be started, stopped, or changed from fast to slow, or the table raised or lowered by the operator without changing his position.

ALL THE JOURNALS and wearing surfaces are provided with self-oiling devices and so inclosed to prevent the admission of dust or dirt. The lubrication throughout has been given special attention, and all the oil reservoirs are bored from the solid, there being no core sand to work into the bearings.

THE COUNTER: Shaft, 9 feet long, $2\frac{3}{16}$″ diameter; three ball and socket adjustable drop hangers; two driving pulleys, 26″ × 5½″ for the upper head; one driver, 26″ × 6½″, for lower head; one driver each, 16″ × 3½″, and 18″ × $3\frac{1}{2}$″ to drive subcounter on machine. Auxiliary counter for lower head: shaft, $1\frac{15}{16}$″ × 48″; one hanger; one special tightener; one pulley, 14″ × $6\frac{1}{2}$″, with cross belt to 26″ × 6½″ pulley on main counter; one pulley, 12″ × $6\frac{1}{2}$″, to drive lower head. Tight and loose pulleys, 16″ x 8″; speed, 800 rotations per minute.

HORSE POWER to drive, 15; floor space occupied, 99″ × 66″.



No. 90 Automatic Triple Trunk Slat Planer.

Export Shipping Weight, 2,400 Pounds.

Net Weight, 1,900 Pounds.

Cubic Measurement, 78 Feet.

Cable Word, TAREDES.

No. 90 Automatic Triple Trunk Slat Planer.

Export Shipping Weight, 2,400 Pounds.
Net Weight, 1,900 Pounds.
Cubic Measurement, 78 Feet.
Cable Word, TAREDES.

THIS ENGRAVING represents our new No. 90 Automatic Triple Trunk Slat Planer, designed for rapidly and accurately planing three trunk slats at one time with an inexpensive operator to handle it and produce about 40,000 slats smoothly planed in 10 hours.

THE FRAME, of neat design, is cast in one piece with cored center and a wide floor base to stand firm.

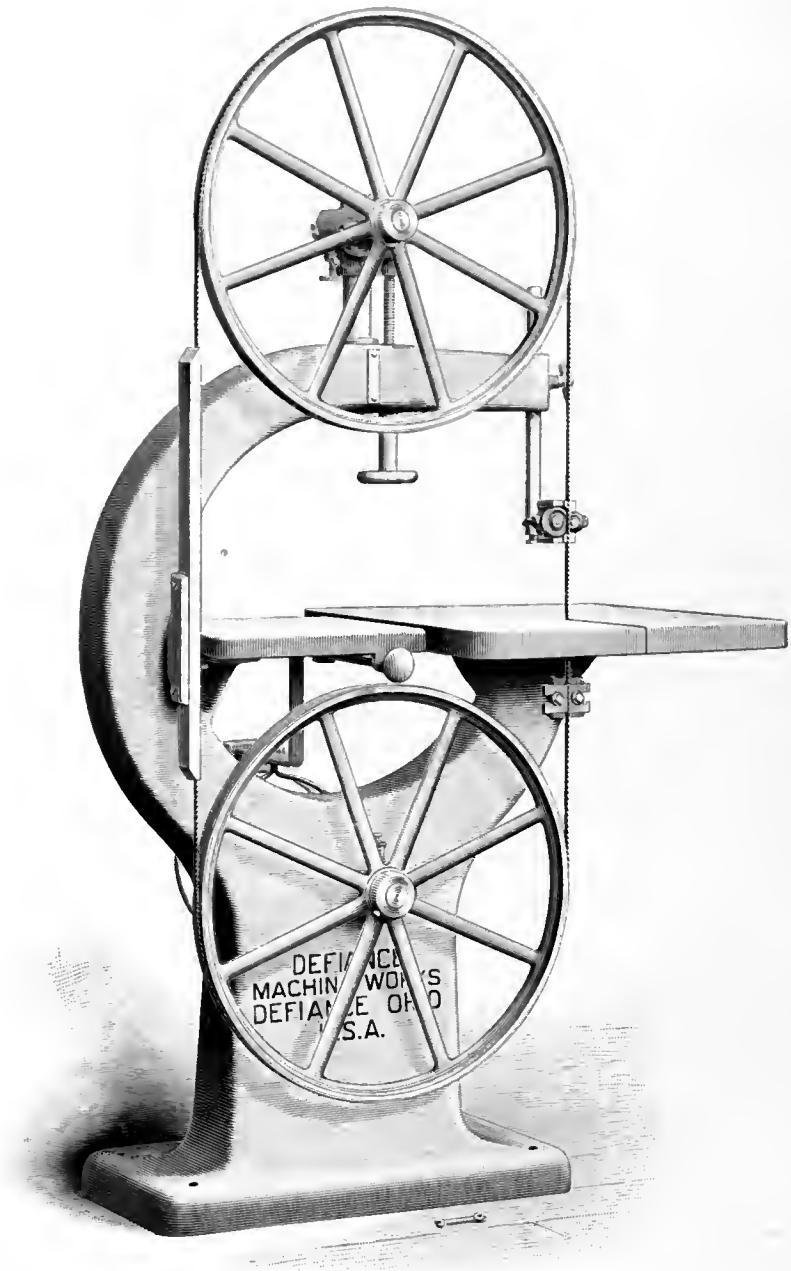
THE CUTTER HEAD SPINDLE, of ground steel, is supported in three long self-lubricating bearings. The left-hand bearing is removable by loosening a single screw giving free access to the cutter head to slip them on or off the spindle without disturbing any of the adjustments of the machine. Three steel cutter heads are used, each carrying two cutters which are milled out their full length to the exact size and shape of the slats to be planed. All the cutter heads can be fitted with knives to plane work to the same size, or each can be supplied with different sized cutters, so that one, two or three sizes of slats can be made with the machine at one and the same time. By the use of milled cutters the correct size and shape of the work is always maintained and in sharpening it is simply necessary to grind the cutting edge straight over.

THIS MACHINE is provided with twelve live feed rolls, six above and six below the table, and they are located close up to the cutter head to properly hold and feed the slats and prevent elipping the ends. Each cutter head is supplied with a bonnet which is fitted with a hardened tool steel die that rests on the slat just ahead of the cut. These bonnets, as well as the upper feed rolls, can be instantly thrown back out of the way giving free access to the cutter heads. All the gears are cut from the solid, which gives a steady motion to the feed enabling the machine to do smooth and true work.

THE WORK is planed on one side and both edges rounded at one pass through the machine, and the planing is accomplished so smoothly that no further finishing is necessary.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 58''$; two No. 2 Ball and Socket 20″ Drop Hangers; one driving pulley, $18'' \times 8''$; tight and loose pulleys, $12'' \times 6''$; speed, 1,200 turns per minute.

HORSE POWER to drive, 5; floor space occupied, $40'' \times 50''$.



28″ Patent Band Sawing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 77 Feet.

Cable Word, SEAGULL.

28″ Patent Band Sawing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 77 Feet.

Cable Word, SEAGULL.

THIS ENGRAVING represents our new 28″ Patent Band Sawing Machine, which contains many patented features and improvements. Every detail of construction embodies the highest grade of workmanship rendering it the smoothest running and handiest machine offered of this kind. It is built by the use of automatic machines and skilled workmen, and it therefore can be sold at a moderate price. It will be found a most desirable tool for piano and organ factories, pattern work and woodworkers in general.

THE FRAME is handsomely designed, cast in one piece, with cored center, making it very stiff and reliable and a broad floor base to stand firm.

THE WHEELS are 28″ diameter, 1½″ face, covered with pure rubber bands, ground true after fitting to the wheels and given a running balance, and they are supported upon ground steel spindles of large diameter running in long bronze self-lubricating bearings of the reservoir system. The lower wheel is of the solid web type, with metal cover to protect operator. The upper wheel is of light arm construction and is enclosed with screen safety guard.

THE TENSION DEVICE is an ingenious affair. It maintains automatically a uniform tension to the saw blade, so that light or heavy sawing in hard or soft wood can be accomplished without fear of the saw blade breaking or running off the wheels.

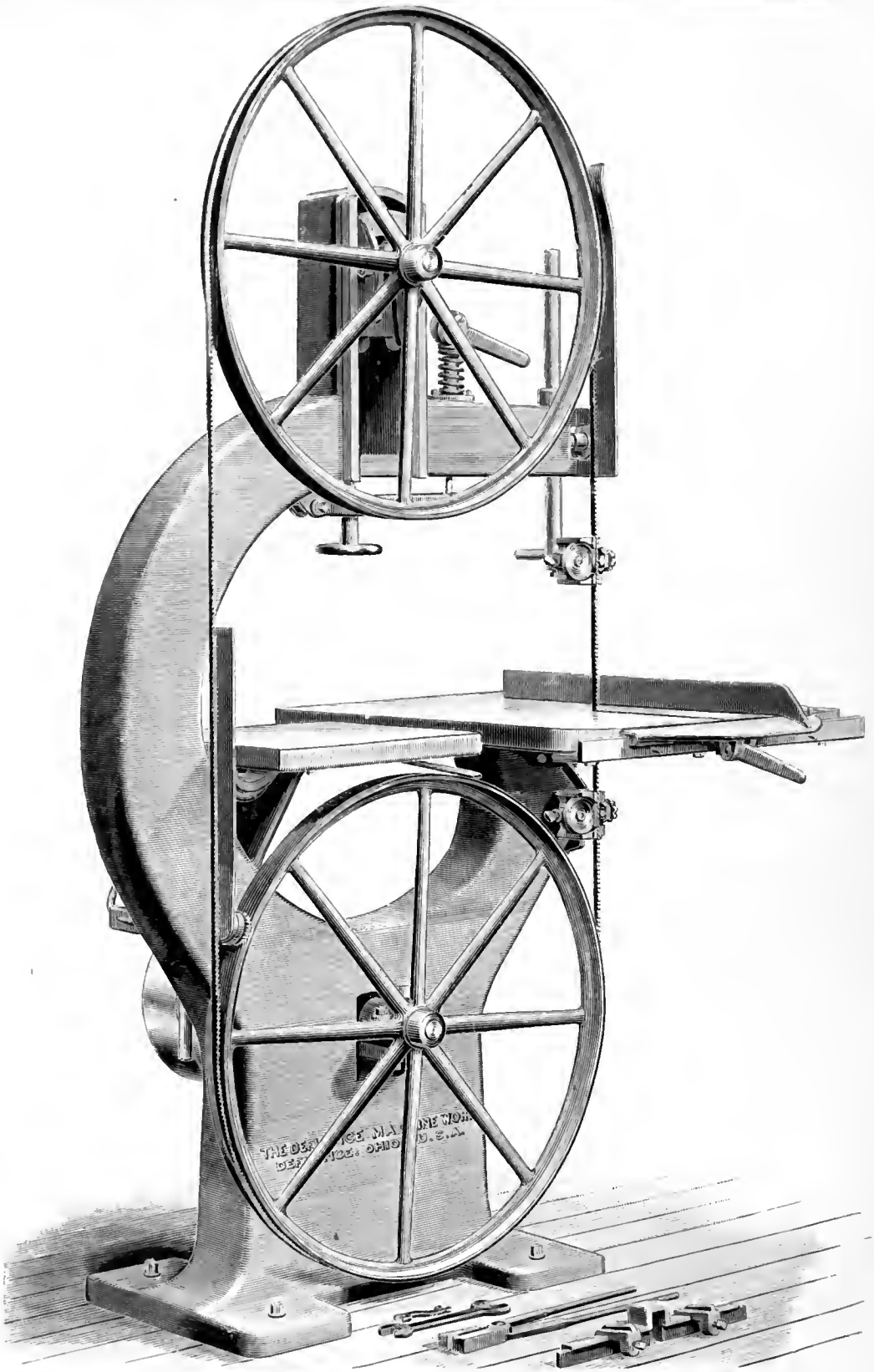
THE TABLE, of iron, in one piece, planed perfectly true, is 24″ × 28″ and can be instantly tilted to any angle up to 45 degrees for conical or bevel sawing.

THE SAW GUIDES are of the patent non-friction type and they will not heat or injure the saw.

THIS MACHINE will take material up to 12″ thick and under, and the saw blade used is 14 feet 10″ long.

THE TIGHT AND LOOSE PULLEYS are 10″ diameter, 4″ face; speed, 700 revolutions per minute, with the loose pulley constructed with self-oiling reservoir hub and bronze bearings. Each machine is furnished with one ⅜″ band saw blade, brazing tongs and vise, with the necessary oil cups and wrenches.

HORSE POWER to drive, 1; floor space occupied, 34″ × 46″.



No. 1 Patent 36″ Band, Scroll, and Rip Sawing Machine.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,400 Pounds.
Cubic Measurement, 133 Feet.
Cable Word, SKYKO.

No. 1 Patent 36″ Band, Scroll, and Rip Sawing Machine.

Export Shipping Weight, 2,000 Pounds.

Net Weight, 1,400 Pounds.

Cubic Measurement, 133 Feet.

Cable Word, SKYKO.

THIS ENGRAVING represents our new No. 1 Patent 36″ Band, Scroll, and Rip Sawing Machine, which contains many new patented features found in no other machine offered for this work. It is capable of carrying a saw blade as narrow as ⅛″, suitable for the very finest scroll sawing, such as required in piano and organ factories, pattern work, planing mills, and other similar classes of work. Also for the heavier kinds of sawing, such as cutting out plow beams, wagon and carriage wood stock, agricultural implement parts, etc., from hard woods, using a saw blade as wide as 2″. The adjustments on this machine are so perfect that it can be run constantly on light or heavy work, without the fear of injury to the saw blade or the machine.

THE FRAME, of neat design, is cast in one piece, with cored center, making it strong and reliable, and it is provided with a broad floor base to stand firm.

THE SADDLE, which supports the upper wheel, is accurately fitted to the frame in planed angle ways, scraped to an accurate bearing. It is adjustable up and down by hand wheel and screw to accommodate various lengths of saw blades, taking at the longest a saw 18½ feet.

THE WHEELS are 36″ in diameter, 2½″ face, covered with a solid endless rubber band ¼″ thick; they are ground perfectly true and balanced by our patent centrifugal balancing machine, making them capable of obtaining a high rate of speed without any vibration whatever. An ingenious spring device is used in connection with the upper wheel, to secure the exact amount of tension to the saw blade, which instantly accommodates itself for light or heavy sawing, unlike the old style weight affair, which is cumbersome and slow to act. It is a well-known fact that a spring will act one hundred times quicker than a weight, which means that a spring tension will meet and correct one hundred variations in the strain of a saw while a weight is getting in motion to take care of one, and very likely, because of its inertia, missing that. The saw will cut perfect work only when the tension is accurate. By a single hand screw, the upper saw wheel can be tilted, while running, to lead the saw to any path desired over the face of the wheels.

THE TABLE, of iron, is 30″ × 34″, planed true on top and arranged to tilt for bevel work to 45 degrees angle. It is fitted with a patent rip saw gauge, and laid off in inches and fractions, to set the gauge the desired distance from the saw for straight sawing or ripping lumber; this gauge can be instantly placed on or removed from the machine.

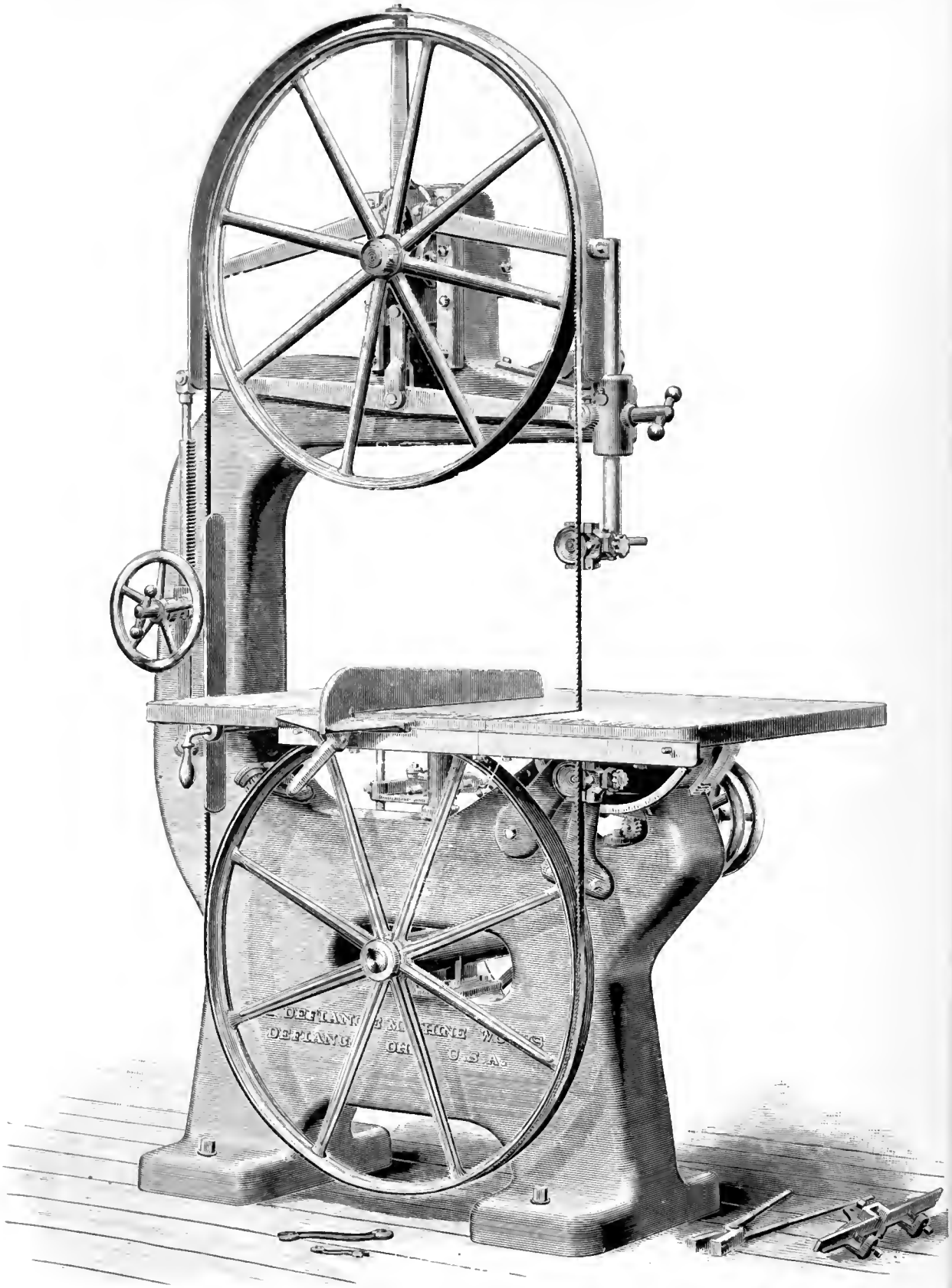
THE SAW GUIDES are of the patent non-friction type, and they will not heat or injure the saw.

THIS MACHINE measures 36″ from the inside of the frame to the center of the table, and, when the guide stem is elevated to its highest position, will take work 12½″ thick.

ALL THE SPINDLES are of forged steel and run in long self-lubricating bearings.

THE TIGHT AND LOOSE PULLEYS are 14″ diameter, 4″ face, and provided with an improved belt shipping apparatus, to be operated from the front side of the machine, and they should run 500 turns per minute. The loose pulley is fitted with bronze bearings and self-oiling device.

HORSE POWER to drive, 1½; floor space occupied, 42″ × 60″.



No. 3 Patent Heavy Band, Scroll, and Rip Sawing Machine.

Export Shipping Weight, 3,000 Pounds.
Net Weight, 2,300 Pounds.
Cubic Measurement, 147 Feet.
Cable Word, SOUSA.

No. 3 Patent Heavy Band, Scroll, and Rip Sawing Machine.

Export Shipping Weight, 3,000 Pounds.

Net Weight, 2,300 Pounds.

Cubic Measurement, 147 Feet.

Cable Word, SOUSA.

THIS ENGRAVING represents our new No. 3 Patent Heavy Band, Scroll, and Rip Sawing Machine, which contains many patented improvements. It is heavy and accurately fitted in every detail. It is capable of carrying from the very narrowest saw blades for the finest scroll sawing up to saws 2″ wide for heavy work, and it is capable of doing more and better work and running smoother than any other band saw on the market.

THE FRAME, of new and original design, is heavy and well proportioned. It is cast in one piece with cored center and a broad floor base to stand firm.

THE TABLE, of iron, is large and roomy, measuring 36″ between the saw and the inside of the frame. It is arranged to tilt for bevel work to 45 degrees angle, by a circular rack and pinion operated by a convenient hand wheel which is provided with a friction binder to lock the table rigidly in any position. The circular bearing underneath the table is laid off with a degree scale so that it can be quickly and accurately set to any position required.

A PATENT RIP SAW GAUGE is furnished with each machine with the top of the table laid off in inches and fractions, so that the gauge can be set the desired distance from the saw without the use of a rule. This gauge can be used on either side of the saw, and it can be instantly removed from the table when not in use.

THE WHEELS are 36″ in diameter, 2½″ face, covered with a solid endless rubber band ¼″ thick, which are ground perfectly true after being placed in position on the machine, after which they are given a running balance. The wheel spindles are large and run in self-lubricating bronze bearings.

THE GUIDE STEM is perfectly balanced at any position, and it is provided with a vertical adjustment sufficient to take 16¼″ under the guide when elevated to its highest position.

THE WRIGHT PATENT non-friction guides are used both above and below the table, which entirely overcomes any chance to crystallize or heat the saw blade.

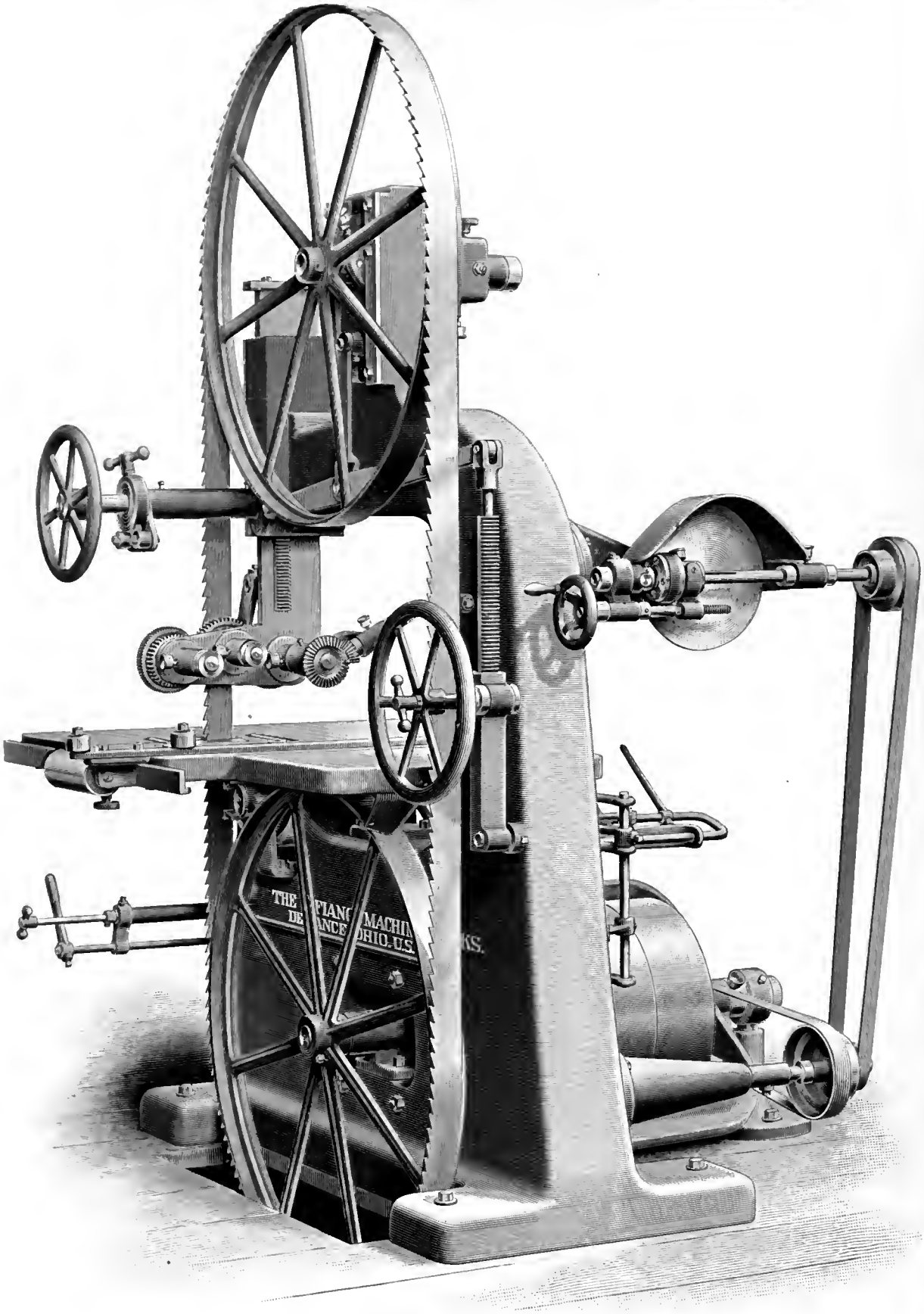
THE TENSION DEVICE to the upper wheel is an ingenious affair and it fills two important requirements, one to quickly adjust the upper wheel for the length of the saw blade, and the other to give the exact tension to the saw. It consists of rack and pinion operated by a convenient hand wheel provided with a friction binder to lock it in any position desired. To the upper end of the rack a horizontal steel bar is attached which extends across to the front of the machine with the upper saw wheel connected to it in the center. This bar has sufficient elasticity to give the proper tension to the saw under all conditions. By its use too much strain cannot be thrown on the saw blade, as with the old style weight device, and the saw can be placed on or taken off the machine in one-fourth the time required by the old method of screw adjustment.

THE UPPER WHEEL has a tilting adjustment, which can be made, while the machine is running, to lead the saw blade to any path desired over the face of the wheels. It is also provided with a steel safety guard which is adjustable with it.

EACH MACHINE is furnished with a narrow band saw blade, and one 2″ rip saw blade with brazing tongs and vise, and the necessary oil cups and wrenches.

THE TIGHT AND LOOSE PULLEYS are 16″ × 4″ with the loose pulley fitted with bronze bearing and self-oiling device, and they should run 475 turns per minute. A convenient belt shipper is furnished for starting or stopping the machine from the working side.

HORSE POWER to drive, 2; floor space occupied, 48″ × 66″.



No. 4 Patent Power Feed Band Ripping Saw.

Export Shipping Weight, 5,300 Pounds.
Net Weight, 3,800 Pounds.
Cubic Measurement, 270 Feet.
Cable Word, SANGERFEST.

No. 4 Patent Power Feed Band Ripping Saw.

Export Shipping Weight, 5,300 Pounds.

Net Weight, 3,800 Pounds.

Cubic Measurement, 270 Feet.

Cable Word, SANGERFEST.

THIS ENGRAVING shows our No. 4 Patent Power Feed Band Ripping Saw, which represents the very highest type of this class of machinery. It is perfectly safe to operate, there being no tendency to throw the stock back, as with a circular saw, and the saw kerf, being much less, effects a large saving in lumber, and it cuts much smoother and truer. It will take 30″ between the fence and saw blade, and any size narrower, and up to 12″ thick and under. It will saw the stock square or to any bevel, as the table is provided with a tilting adjustment, a most desirable feature for sawing out moulding blanks and other bevel work, which cannot be performed on any other power feed band ripping saw on the market. It also has the advantage of ripping exceedingly short or long material, as the feeding rolls are close together. All the adjustments are made from the working side of the machine. The starting and stopping, changing the rate of feed for sawing various widths and thicknesses of lumber, straight or beveling, all can be quickly made without the operator leaving his position.

THE FRAME, of modern design, is cast in one piece, with cored center, is very heavy and stiff, to overcome all tendency to spring or vibrate when doing the very heaviest class of work, and it is provided with an exceedingly wide floor base to stand firm.

THE TABLE is exceedingly large and roomy, and it is fitted with rollers both in front and behind the saw to prevent friction. It is plainly laid off, with a scale, in inches and fractions, to quickly set the gauge the desired distance from the saw. This gauge or fence can be used on either the right or left hand side of the saw, and it is equipped with a horizontal roller at the front end and two vertical rollers on top to remove as much friction as possible, to make the lumber pass through the machine with the greatest ease. The table can be instantly tilted to any angle up to 45 degrees to a scale underneath the table.

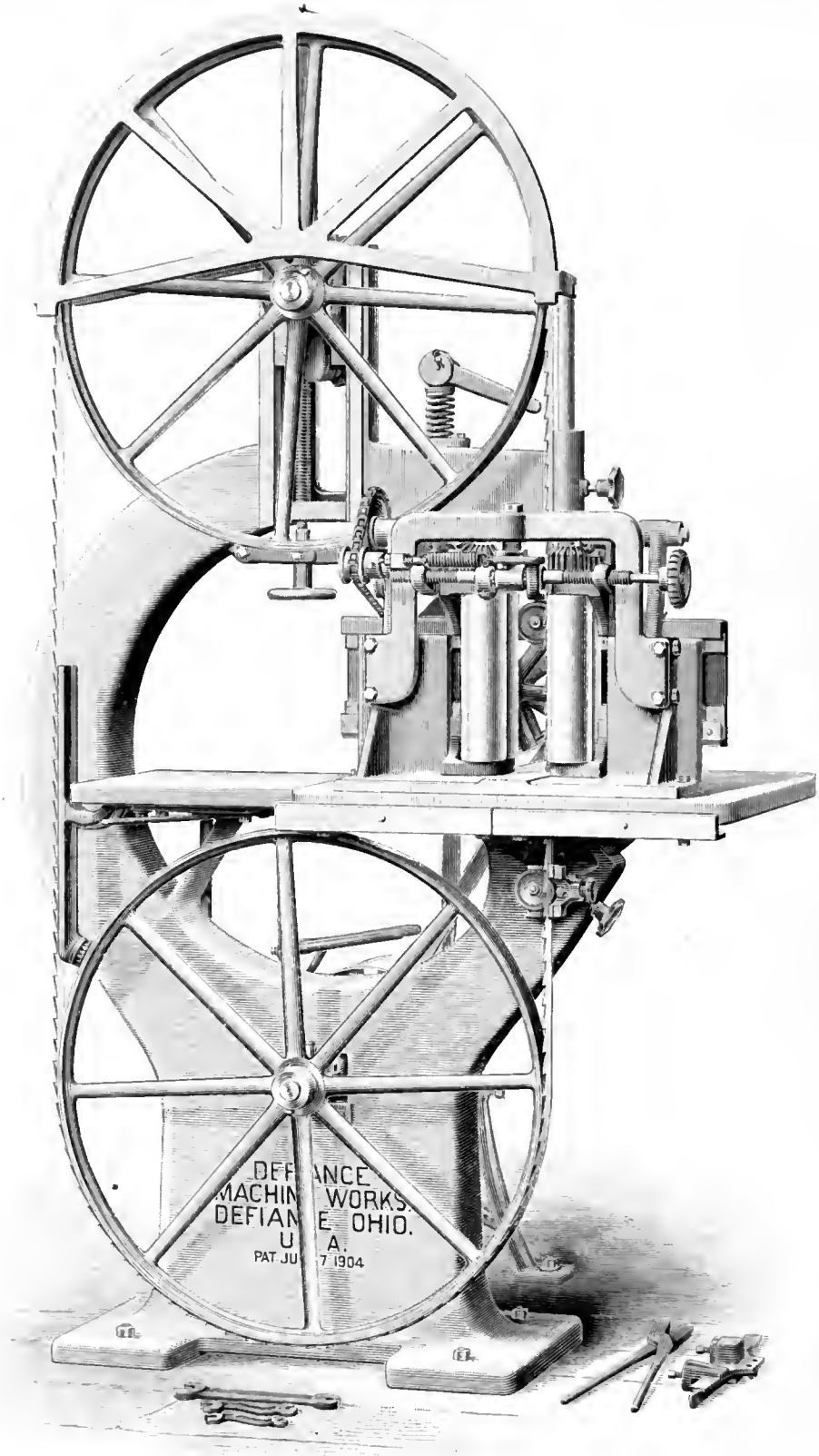
THE WHEELS are 44″ diameter, ground perfectly true, and balanced by our Patent Rotary Balancing Machine, making them capable of obtaining a high rate of speed, entirely free from vibration. The wheel spindles are of steel, extra heavy, and they rotate in long, self-lubricating bronze bearings. An ingenious spring device is used in connection with the upper wheel to secure the exact amount of tension to the saw blade, which instantly accommodates itself for light or heavy sawing, unlike the old style weight affair, which is cumbersome and slow to act. It is a well-known fact that a spring will act one hundred times quicker than a weight, which means that a spring tension will meet and correct one hundred variations in the strain of a saw while a weight is getting in motion to take care of one, and very likely, because of its inertia, missing that. The saw will cut perfect work only when the tension is accurate. By this new device, it is almost impossible to break or injure the saw, and the saw can be instantly placed on or off the machine. By the adjustment of a single hand screw, the upper saw wheel can be tilted, while running, to lead the saw to any path desired over the face of the wheels.

THE PATENT SAW GUIDES will not heat or injure the saw, enabling the machine to run constantly on the heaviest work.

THE FEED is very powerful. It is driven by cut gears, which furnish a perfectly steady motion, and it can be instantly adjusted to feed from 50 to 150 feet per minute, having four changes of feed. The feed rolls have a vertical adjustment by hand wheel to accommodate stock from 0 to 12″ thick, with an automatic vertical movement of one inch to accommodate variations in thickness of stock, so that boards or plank of different thicknesses can be fed through the machine without cramping or injuring the working parts. By elevating the feeding apparatus to its highest position, the machine can be used, if desired, as a hand feed band ripping saw. The saw blade furnished is 22½ feet long, 3″ wide, 20 gauge, which furnishes a large amount of cutting surface, and, the blade being thin, removes a very small amount of stock.

THE TIGHT AND LOOSE PULLEYS are 20″ diameter, 6″ face, and should run 500 rotations per minute. The loose pulley is fitted with bronze bearings and a self-oiling device, and is equipped with a convenient belt shipping apparatus, which is operated from the working side of the machine.

HORSE POWER to drive, 5; floor space occupied, 70″ × 75″.



No. 6 Patent 36″ Band, Scroll, Rip and Re-Sawing Machine.

Export Shipping Weight, 2,400 Pounds.
Net Weight, 1,800 Pounds.
Cubic Measurement, 133 Feet.
Cable Word, SEABIRD.

No. 6 Patent 36″ Band, Scroll, Rip and Re-sawing Machine.

Export Shipping Weight, 2,400 Pounds.

Net Weight, 1,800 Pounds.

Cubic Measurement, 133 Feet.

Cable Word, SEABIRD.

THIS ENGRAVING represents our new No. 6 Patent 36″ Band, Scroll, Rip and Re-sawing Machine, which is a most conveniently arranged tool for doing various kinds of band scroll sawing, ripping and re-sawing lumber. It is a combination of three machines in one, and it can be changed in a few moments' time from one class of work to the other. It has proven to be a general favorite among wood workers. It is suited to the very finest scroll sawing required in piano and organ factories, pattern shops, fancy wood-workers, etc., as well as the heavier kinds of work such as sawing plow beams, wagon and carriage wood stock, agricultural implement parts, ship and car work, sawing hard wood with a saw blade as wide as 2″. All the adjustments on this machine are so perfect that it can be run constantly without injury to the saw blade or the machine.

THE FRAME, of modern design, is cast in one piece, with cored center, making it strong and reliable, and provided with a broad floor base to stand firm.

THE SADDLE supporting the upper wheel is accurately fitted to the frame in planed and scraped angle-ways; it is adjustable vertically by hand wheel and screw to accommodate various lengths of saw blades, taking at the longest a saw 18½ feet.

THE SAW WHEELS are 36″ diameter, 2½″ face, covered with solid endless rubber bands ¼″ thick, which are ground true and given a running balance by our patent method, making them capable of running at a high rate of speed entirely free from vibration.

THE PATENT TENSION DEVICE is provided with a compression spring in connection with the upper wheel, which provides the exact amount of tension to the saw under all conditions, instantly accommodating itself for light or heavy sawing unlike the old style weight affair, which is cumbersome and slow to act. It is a well-known fact that a spring will act 100 times quicker than a weight, which means that the spring tension will meet and correct 100 variations in the strain of the saw while the weight is getting in motion to take care of one, and very likely, because of its inertia, missing that. The saw will cut perfect work only when the tension is accurate. By a single hand screw, the upper saw wheel can be tilted while running to lead the saw to any path desired over the face of the wheels.

THE TABLE of iron is 30″ × 34″, planed true and arranged to tilt to 45 degrees angle for bevel sawing. The top is laid off in inches and fractions and fitted with a patent rip saw gauge, to be used for ripping lumber. This gauge can be instantly placed on or removed from the machine.

PATENT NON-FRICTION GUIDES are used above and below the table, and they are warranted not to heat or injure the saw blade.

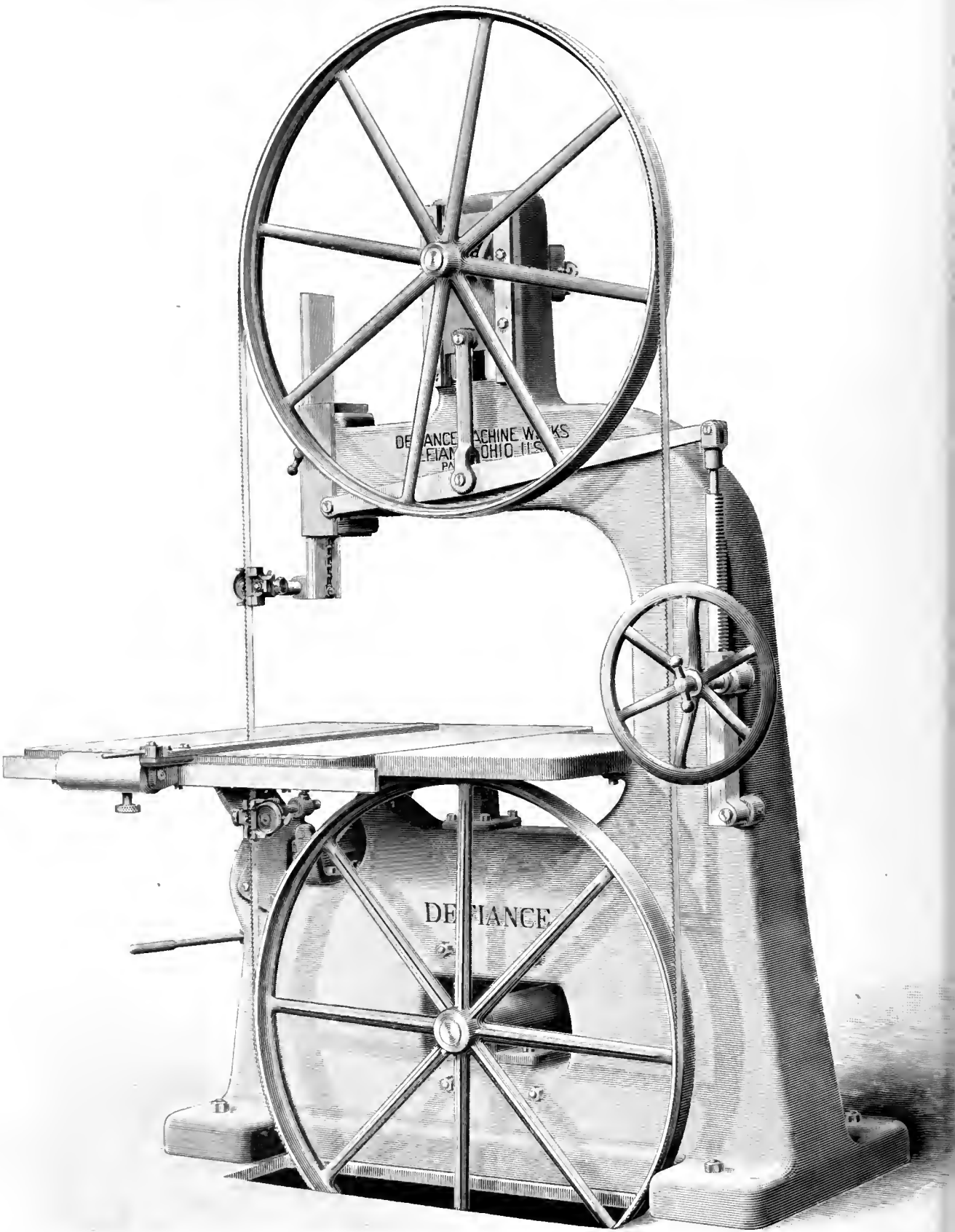
THE RE-SAWING ATTACHMENT consists of four vertical feed rolls, all powerfully driven, with three changes of feed to saw 20, 30, and 40 feet per minute, and it will accommodate material up to 12″ wide × 4″ thick or any sizes under, and it will saw the stock parallel or beveling and to any thickness required.

THIS MACHINE measures 36″ from the inside of the frame to the center of the table, giving ample room for wide sawing. When the guide stem is lifted to its highest position, it will take work 12½″ thick.

ALL SPINDLES are of ground steel and run in long self-lubricating bearings.

THE TIGHT AND LOOSE PULLEYS are 14″ diameter, 4″ face, and provided with an improved belt shipper, to be operated from the front side of the machine, and they should run 500 turns per minute. The loose pulley is fitted with bronze bearings and a self-oiling device.

HORSE POWER to drive, 3; floor space occupied, 42″ × 60″.



No. 8 Patent 44″ Band, Scroll and Rip Sawing Machine.

Export Shipping Weight, 4,000 Pounds.
Net Weight, 3,000 Pounds.
Cubic Measurement, 270 Feet.
Cable Word, SPITZKOP.

No. 8 Patent 44″ Band, Scroll and Rip Sawing Machine.

Export Shipping Weight, 4,000 Pounds.
Net Weight, 3,000 Pounds.
Cubic Measurement, 270 Feet.
Cable Word, SPITZKOP.

THIS No. 8 MACHINE is extra large, especially designed to meet the requirements of car and railroad shops, ship builders and any other heavy and deep sawing. Its capacity and range of work are large, carrying a saw blade as wide as 3″, although narrow saws can be used for the lighter kinds of scroll sawing.

THE COLUMN is massive and heavy, cast in one piece, with cored center and a broad floor base to stand firm and be driven at a high rate of speed without vibration.

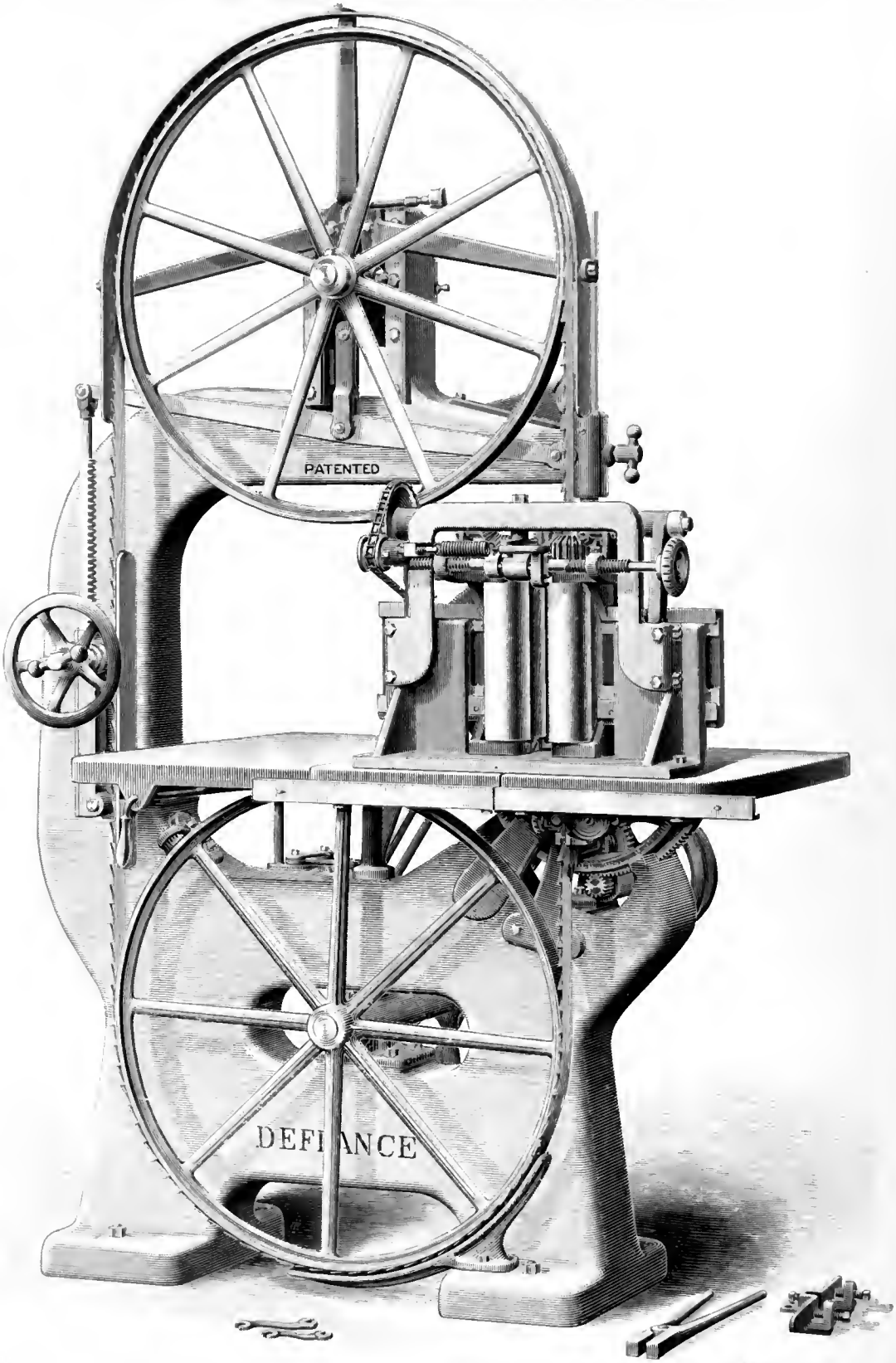
THE SAW WHEELS are 44″ in diameter, covered with endless rubber bands, ground true and given a running balance, and they are supported upon heavy ground steel spindles rotating in long self-lubricating bronze bearings. The patent tension device to the upper wheel secures the exact amount of tension to the saw blade, instantly accommodating itself for light or heavy sawing. By a single hand screw the upper wheel can be tilted while the machine is in motion to lead the saw to any path desired over the face of the wheels. The saw blade used is 22½ feet long.

THE GUIDE BAR is counterbalanced for the convenience of adjusting to different thicknesses of work, and the saw guides both above and below the table are of the patent non-friction type.

THE TABLE, of iron, in one piece, is planed true. It is 36″ × 44″, laid off in inches and fractions and fitted with a patent ripping gauge. It can be tilted instantly to any angle up to 45 degrees to a scale underneath the table. The greatest distance between the table and guide bar when elevated to its highest position is 18½″, and the distance between the saw blade and the inside of the column is 36″. The total height of the machine is 102″.

THE TIGHT AND LOOSE PULLEYS are 20″ diameter, 6″ face, and should run 500 rotations per minute. The loose pulley is fitted with bronze bearings and a self-lubricating device. A convenient belt shipper is furnished to be operated from the working side of the machine. The lower wheel shaft is provided with an outside bearing.

HORSE POWER to drive, 5; floor space occupied, 64″ × 70″.



No. 9 Patent Heavy Band, Scroll, Rip and Re-sawing Machine.

Export Shipping Weight, 3,500 Pounds.
Net Weight, 2,800 Pounds.
Cubic Measurement, 147 Feet.
Cable Word, SPINETTO.

No. 9 Patent Heavy Band, Scroll, Rip and Re-sawing Machine.

Export Shipping Weight, 3,500 Pounds.
Net Weight, 2,800 Pounds.
Cubic Measurement, 147 Feet.
Cable Word, SPINETTO.

THIS ENGRAVING represents our No. 9 Patent Heavy Band, Scroll, Rip and Re-sawing Machine, which is a combination of three machines in one, and it will be found a most desirable and useful tool for woodworkers in general. It will do all kinds of scroll sawing from the most delicate work, using the finest saw blade, up to sawing heavy hard wood such as used in wagon, agricultural implement, railway car and ship construction work. It is capable of carrying a saw blade up to 2″ wide, and as a hand feed ripping saw it covers every requirement. It will be found more economical than a circular saw as the saw kerf is smaller, and it will do more work and do it easier without the liability of injuring the operator. As a re-sawing machine it will split lumber 12″ wide and anything narrower, either straight or beveling, and it will saw smooth and true. It can be changed in a moment's time from one class of work to the other.

THE FRAME is a massive casting in one piece, with cored center and a broad floor base to stand firm. Every line in its design is new and original.

THE TABLE of iron is in two parts. The one at the left is stationary and it is 20″ × 29″. The main table is 30″ × 34″, and it is arranged to tilt for bevel sawing to 45 degrees angle, by a circular rack and pinion operated by a convenient hand wheel which is provided with a friction binder to lock the table and hold it in any desired position. The circular bearing underneath the table is laid off in degrees so that it can be accurately set to any angle required. The distance from the inside of the frame to the saw is 36″, and it measures 51″ from the inside of the frame to the outside edge of the table, giving ample room for large, wide sawing.

THE PATENT RIP SAW GAUGE is attached to the table by a friction binder, and it can be instantly set to any position. It can be used on either the right or left hand side of the saw. A scale is laid off on the table by which to set the gauge the desired distance from the saw without the use of a rule.

THE RE-SAWING ATTACHMENT consists of four vertical feed rolls, all powerfully driven, with three changes of feed to saw 20, 30 and 40 feet per minute, and it will accommodate material up to 12″ wide × 4″ thick, or any sizes under, and it will saw the stock parallel or beveling and to any thickness required.

THE SAW WHEELS are 36″ diameter, 2½″ face, covered with a solid, endless rubber band ¼″ thick, and they are ground true. The wheels are given a perfect running balance. The wheel spindles of steel are large in diameter and run in long self-lubricating bronze bearings.

THE GUIDE STEM is perfectly balanced in any position and when elevated to its highest position will take 16¼″ under the guide.

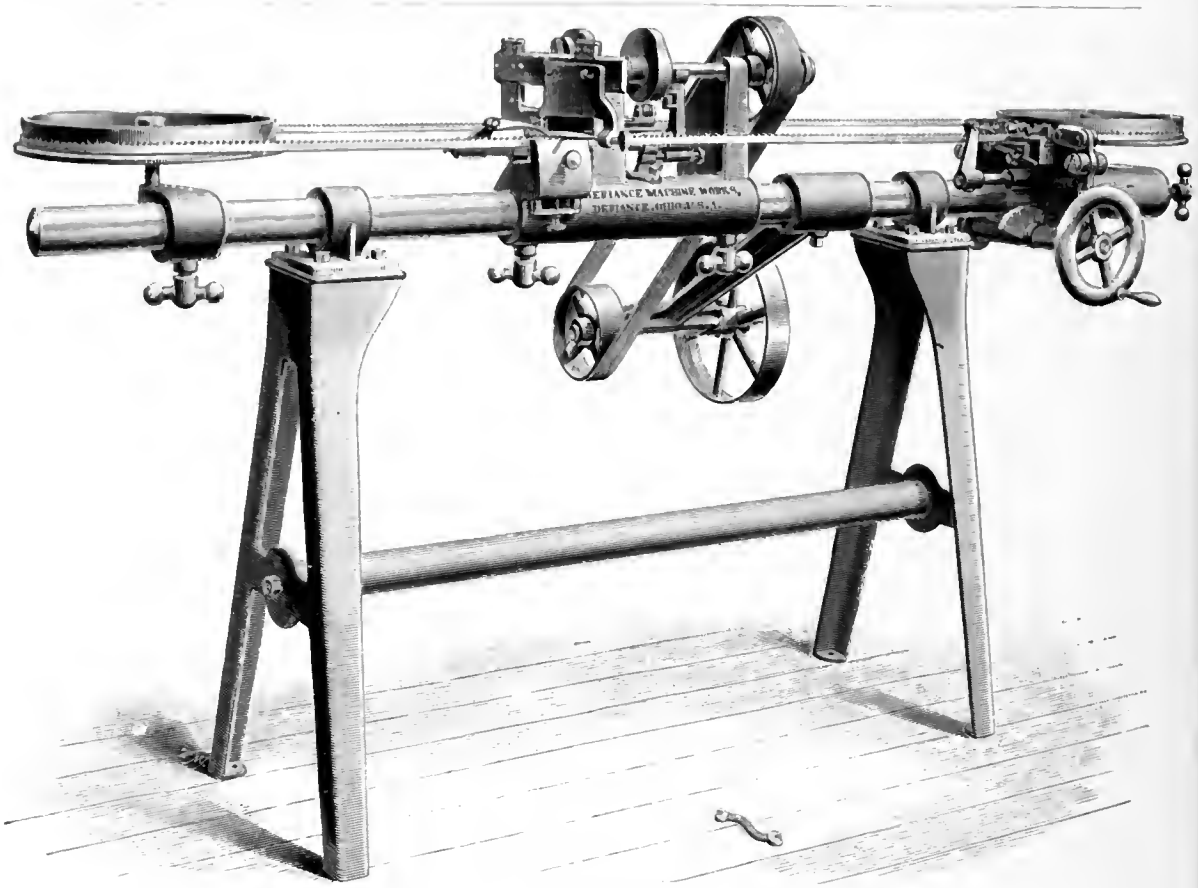
THE PATENT NON-FRICTION GUIDES are used both above and below the table, which entirely overcomes any chance to crystallize or heat the saw blade.

THE TENSION DEVICE to the upper wheel is something entirely new and original with us, and is a decided improvement over the cumbersome weight devices generally used. By this improvement the saw blade can be instantly placed on or taken off the wheels by a single turn of the hand wheel, which operates a vertical rack which raises and lowers the upper wheel to suit the length of the saw blade. The horizontal steel bar which connects with the rack and upper saw wheel frame is provided with sufficient elasticity to always furnish the required tension to the saws of different sizes and for different kinds of work.

THE UPPER SAW WHEEL has a tilting adjustment which can be made while the machine is running, to lead the saw to any path desired over the face of the wheels. It is also provided with a steel safety guard to protect the operator.

THE TIGHT AND LOOSE PULLEYS are 16″ × 4″, with the loose pulley fitted with bronze bearings and a self-oiling device, and they should run 475 turns per minute. A convenient belt shipper is provided, which is operated from the working side of the machine.

HORSE POWER to drive, 3; floor space occupied, 48″ × 66″.



No. 1 Automatic Band Saw Filing and Setting Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 600 Pounds.
Cubic Measurement, 75 Feet.
Cable Word, STALK.

THIS MACHINE is used for automatically filing and setting the teeth on band saw blades from $\frac{1}{8}$″ up to $1\frac{3}{8}$″ wide, in various lengths, with teeth from $\frac{1}{16}$″ up to 1″ apart.

THE WORKING PARTS are mounted upon an iron frame of neat design. The wheels over which the saw blade is stretched can be adjusted horizontally upon the shaft to accommodate blades from 8 feet to 24 feet in length. The wheel at the right is provided with a hand-screw to adjust it a limited amount to accurately secure the desired tension to the blade.

THE FILING MACHINE is automatic in all its movements; it can be instantly started or stopped at any point by a clutch without shifting the driving belt; it will file all teeth to an exact height and length to which it may be set; the greatest amount of hook is given to the teeth obtainable with a three-cornered file. After a tooth is filed the file is lifted obliquely from the tooth and held in that position until the back stroke of the file is made, during which time the feeding dog picks up the tooth to be filed, carries it forward to the proper position and retreats, when the file is again presented to its work, and so on until all the teeth are filed. The absence of a brass roller or other device riding on the points of the teeth to hold the saw blade down against the gauges is an important feature.

THE AUTOMATIC SET can be instantly adjusted for teeth of different sizes; each revolution of the hand-wheel will set with accuracy two lineal inches of teeth.

IT WILL correct irregular or misshaped teeth, reducing them to their original shapes.

THE DRIVING PULLEY is 12″ diameter, 2″ face, and should run 40 revolutions per minute.

HORSE POWER to drive, $\frac{1}{8}$; floor space occupied, 24″ × 108″.

Narrow Band Saws.

¼″,	per ft.,	13 cts.	
⅜″,	" "	15	"
½″,	" "	16	"
⅝″,	" "	18	"
¾″,	" "	20	"
⅞″,	" "	21	"
1 ″,	" "	23	"
1⅛″,	" "	25	"
1¼″,	per ft.,	27 cts.	
1⅜″,	" "	30	"
1½″,	" "	33	"
1¾″,	" "	36	"
2 ″,	" "	80	"
2½″,	" "	$1.00	
3 ″,	" "	1.20	

Filing and Setting, 5 cts. per foot extra.

Brazing.

Brazing,	¼″ to ½″,	⅝″ to ⅞″,
Price,	30 cents.	40 cents.
Brazing,	1″ to 1¼″,	1⅜″ to 1½″
Price,	50 cents.	65 cents.

Left-Hand Saw.

Right-Hand Saw.

Concave Saws.

When ordering Concave Saws, give circle to be dished to; also, which side is to be dished or concaved, right or left hand, as the saw runs toward you.

	Gauge.	Price.	Each additional gauge.
4″,	16,	$2.30	5 cts. extra.
6″,	16,	2.50	5 " "
7″,	15,	2.90	6 " "
8″,	15,	3.30	8 " "
9″,	15,	3.80	10 " "
10″,	14,	4.60	13 " "
12″,	14,	6.20	17 " "
14″,	13,	7.60	21 " "
16″,	13,	9.50	25 " "
18″,	12,	11.30	30 " "
20″,	12,	14.20	35 " "

Saws concaved to a smaller circle than 16″, extra price.

Circular Saws.

Diameter.	Thickness. Gauge.	Size of Hole.	Price, each.	Extra for each additional gauge (heavier).	Price for beveling new Saws per gauge.
1″	24	⅜″	$1.00	$0.01	$0.06
1½″	24	⅜″	1.00	.01	.07
2″	23	⅜″	1.00	.01½	.08
2½″	22	⅜″	1.00	.02	.09
3″	21	½″	1.00	.02½	.10
3½″	20	½″	1.20	.03	.12
4″	19	¾″	1.20	.03	.14
5″	19	¾″	1.50	.04	.16
6″	18	¾″	1.80	.05	.18
7″	18	¾″	2.10	.06	.20
8″	18	⅞″	2.40	.08	.22
9″	17	⅞″	2.80	.10	.25
10″	16	1″	3.30	.12	.28
11″	16	1″	3.90	.14	.30
12″	15	1″	4.40	.17	.35
14″	15	1⅛″	5.30	.21	.40
16″	14	1⅛″	6.50	.25	.50
18″	13	1¼″	8.00	.30	.60
20″	13	1 5/16″	9.50	.35	.70
22″	12	1 5/16″	11.50	.45	.80
24″	11	1⅜″	13.50	.55	.90
26″	11	1⅜″	16.00	.65	1.05
28″	10	1½″	18.50	.80	1.20
30″	10	1½″	21.00	.90	1.30
32″	10	1⅝″	24.00	1.00	1.40
34″	9	1⅝″	27.00	1.20	1.55
36″	9	1⅝″	31.00	1.40	1.70
38″	9	1⅝″	35.00	1.75	1.85
40″	9	2″	41.00	2.00	2.00
42″	8	2″	47.00	2.50	2.20
44″	8	2″	55.00	3.00	2.40
46″	8	2″	65.00	3.50	2.60
48″	8	2″	75.00	4.00	2.80
50″	7	2″	85.00	4.50	3.00
52″	7	2″	95.00	5.00	3.25
54″	7	2″	105.00	6.00	3.50
56″	7	2″	120.00	7.00	3.75
58″	7	2″	135.00	8.00	4.05
60″	6	2″	150.00	9.00	4.35
62″	6	2″	170.00	10.00	4.65
64″	6	2″	190.00	12.00	5.00
66″	6	2″	210.00	15.00	5.35
68″	5	2″	235.00	18.00	5.75
70″	5	2″	265.00	21.00	6.15
72″	5	2″	300.00	24.00	6.55
74″	5	2″	340.00	27.00	7.00
76″	5	2″	390.00	30.00	7.50

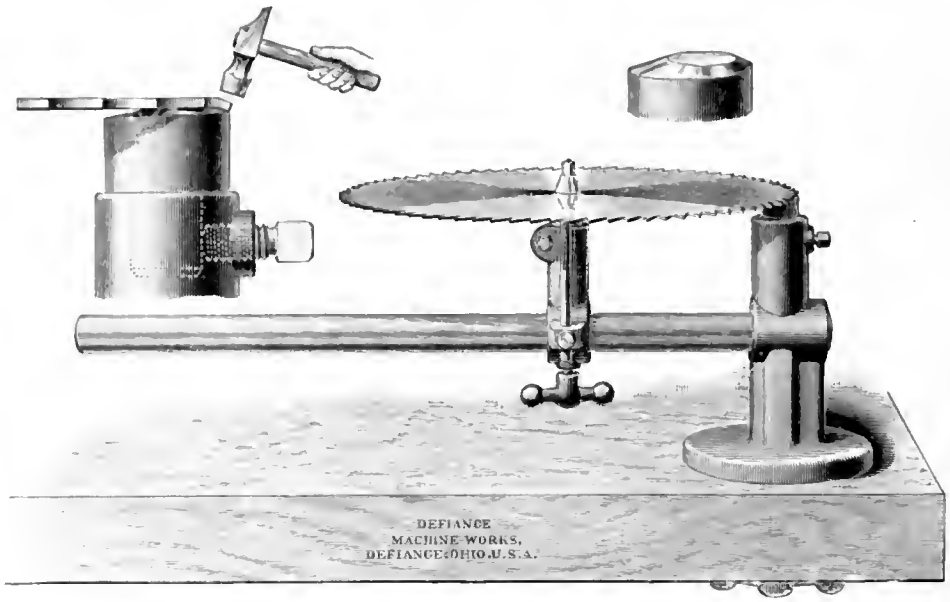
No extra charge for Circular Saws one gauge thicker than list. Extra charge of 10 per cent. for each gauge thinner than list. On Saws 48″ and larger, and when made thinner than list, are not warranted.

Directions for Making Solder-Water.

Feed muriatic acid with all the small pieces of zinc it will eat, and dilute with an equal quantity of water.

Directions for Joining Band Saws.

Bevel each end of the saw the length of two teeth. Make a good joint. Fasten the saw in brazing clamps with the back against the shoulder, and wet the joint with solder-water, or with a creamy mixture made by rubbing a lump of borax in about a teaspoonful of water on a slate. Put in the joint a piece of silver solder the full size thereof, and clamp with tongs heated to a light red (not white) heat. As soon as the solder fuses blacken the tongs with water and take them off. Remove the saw; hammer it if necessary, and file down to an even thickness, finishing by draw filing lengthwise.



Improved Circular Saw Setting Machine.

Export Shipping Weight, 175 Pounds.
Net Weight, 95 Pounds.
Cubic Measurement, 7 Feet.
Cable Word, SALVETER.

THIS ENGRAVING represents a new and useful machine for setting the teeth on circular saws. It is so simple that it can be used by inexpensive labor with perfect results, and from four to five times more work accomplished with it than by any other machine. A trial will prove its value as a labor-saving device.

THIS MACHINE is fastened to the top of a work bench by hand-screw underneath the table, and it can be swung around in any position to best suit the operator's convenience.

THE CENTER PIN, which receives the eye of the saw, is tapering to accommodate saws with small or large sized holes. It is also provided with a vertical adjustment to keep the saw parallel with the face of anvil, and adjustable horizontally upon the parallel bar for saws of varying diameters up to 72″ at the largest.

THE ANVIL is of tempered tool steel, and it is fitted into a reamed hole and held with a binder screw; its upper surface is beveled eccentrically to accommodate a short or long set to the teeth, according to the size of saw, as will be fully understood by referring to the small engraving of the anvil, at the left, above the saw.

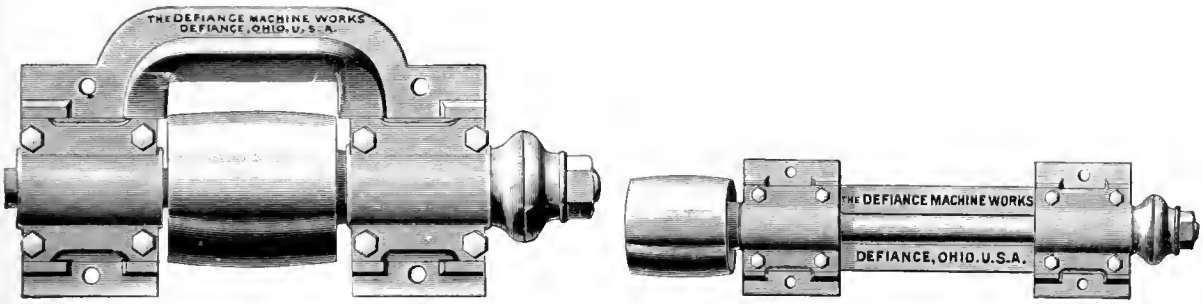
IN OPERATING, the saw should be placed upon the machine, as shown by the engraving, with the anvil adjusted to suit the amount of set desired, then strike every other tooth a sharp blow with the hammer when over the anvil, which bends each tooth alike, then turn the saw over and do likewise upon the teeth that were passed in the first operation, which completes the work.

Saw Hammering Anvil.

THIS ENGRAVING represents a Saw Hammering Anvil used for the purpose of removing kinks from circular and band saws. Its face is true and chilled very hard.

No. 1. 7″ diameter, 3½″ high, weight, 30 pounds.
No. 2. 7″ diameter, 6″ high, weight, 60 pounds.

Cable Word, No. 1 Anvil, SHELL.
Cable Word, No. 2 Anvil, SNAIL.



Improved Yoke and Straight Box Saw Arbors.

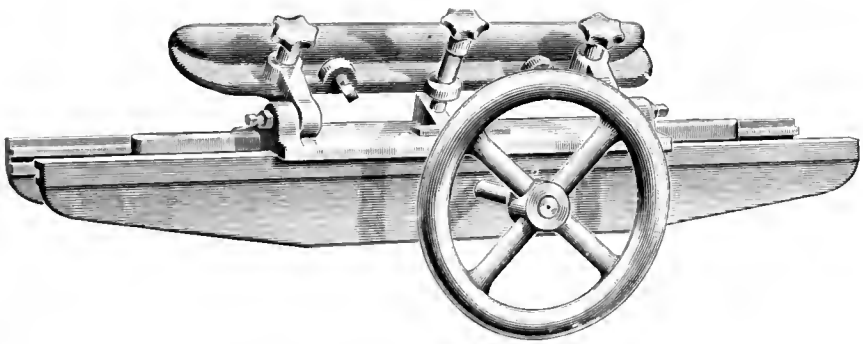
THE ACCOMPANYING ENGRAVINGS are a correct illustration of our improved saw arbors, the bearings of which are cast on a solid bed, connecting the two together in such a manner as to render it impossible for them to get out of line.

THEY ARE lined with genuine babbitt metal, and are self-oiling, having recesses extending diagonally through the lining of the box through which the oil is conducted to the journal, forming a circulation of the oil so that its lubricating properties are fully employed.

THE ARBORS are made of steel and accurately fitted with tight saw collars shrunk on, and the pulleys arranged so as to take up the wear and prevent any end motion.

TWO STYLES are furnished in any sizes, as shown by the engravings and the accompanying list, with yoke or straight box as desired.

No. of Arbor.	Size of Saw.	Diameter of Pulley.	Face of Pulley.	Diameter of Collar.	Diameter of Arbor.	Hole in Saw.	Cable Word.	Price.
1	10″	4″	4½″	3″	1″	⅞″	STAR	$12 50
2	15″	4½″	5″	3½″	1⅛″	1″	SHAPE	15 00
3	20″	5″	5″	4″	1¼″	1⅛″	STEEL	17 50
4	24″	6″	6½″	4½″	1⅜″	1¼″	STOVE	20 00
5	30″	7″	7″	5″	1½″	1⅜″	STENCIL	22 50
6	36″	8″	8″	5½″	1¾″	1½″	STAND	25 00

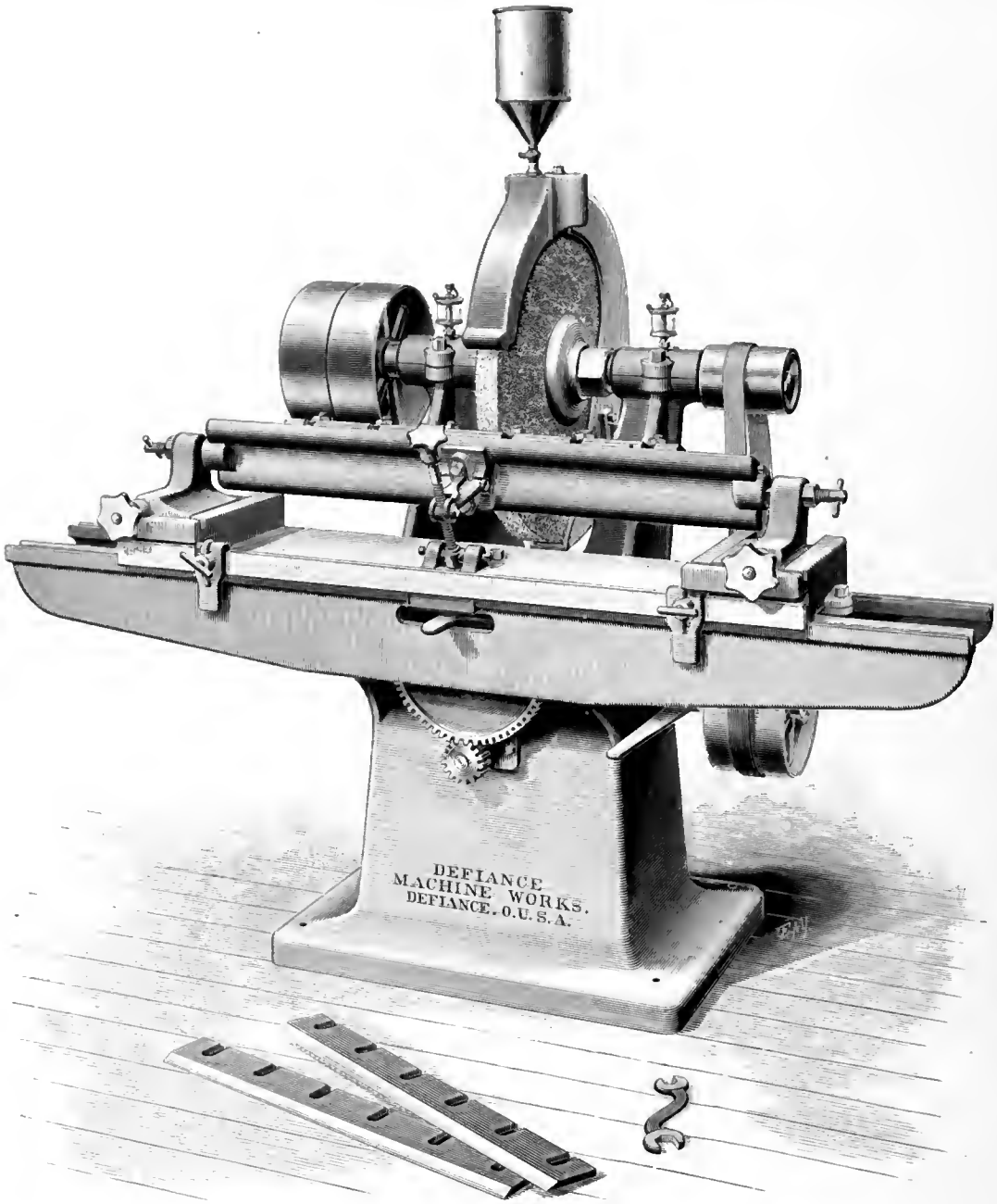


24″ Hand-Feed Knife Grinder.

Export Shipping Weight, 200 Pounds.
Net Weight, 155 Pounds.
Cubic Measurement, 6 Feet.
Cable Word, GUARD.

THIS IS BY FAR the most convenient and reliable device for grinding planer knives, bits, etc. It is made entirely of iron, and can be attached to any grindstone or emery wheel frame. The frame or base is accurately planed and scraped, making the sliding carriage on it fit nicely and work with ease. The plates and jaws which hold the knife are hinged to the sliding carriage, and can be adjusted to any angle or bevel.

THE KNIFE is held firmly in the jaws, and can be adjusted to a nicety by turning the hand-screw on top, making the edge perfectly true and at any bevel. The machine is a very convenient and reliable one. We also furnish this tool with an iron grindstone frame, all complete.



No. 1 Improved Automatic Knife Grinding Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 72 Feet.

Cable Word, 24″ Machine, GORRILLA.

Cable Word, 36″ Machine, GALVANIC.

Cable Word, 48″ Machine, GUANO.

Cable Word, 60″ Machine, GLEAM.

Cable Word, 72″ Machine, GLIMPSE.

No. 1 Improved Automatic Knife Grinding Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,000 Pounds.
Cubic Measurement, 72 Feet.
Cable Word, 24″ Machine, GORRILLA.
Cable Word, 36″ Machine, GALVANIC.
Cable Word, 48″ Machine, GUANO.
Cable Word, 60″ Machine, GLEAM.
Cable Word, 72″ Machine, GLIMPSE.

THIS ENGRAVING represents our No. 1 Improved Automatic Knife Grinding Machine, which has been designed with the greatest care to embody all the essential features necessary to make it the most complete and reliable machine in the market for accurately grinding the cutting edges of knives used in wood-working machines, paper cutting machines, etc. It is simple and substantial, easily taken care of, and it will reduce cutters to a sharp, keen edge.

IT IS BUILT in five sizes to grind knives up to 24″, 36″, 48″, 60″, and 72″ in length.

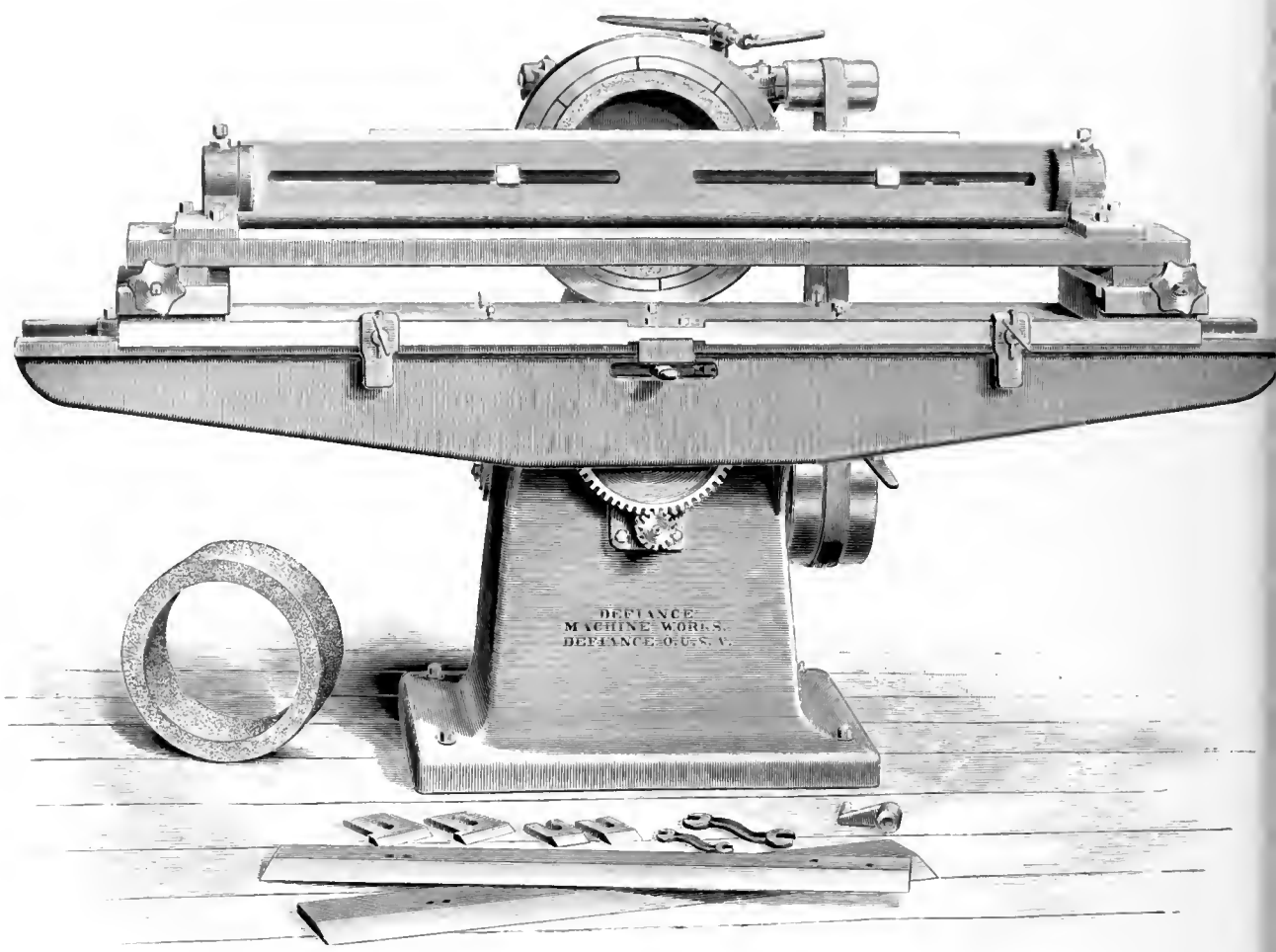
THE FRAME is cast in one piece with cored center, and has a large floor base; the emery wheel used is 22″ diameter, 1½″ face, 2″ hole, and surrounded by an adjustable shield; it can be used for wet or dry grinding as preferred; the use of water upon the wheel prevents burning the knife and enables the work to be finished much quicker; the arbor runs in genuine babbitt metal, self-lubricating bearings, so inclosed to prevent the admission of dust or dirt.

THE TABLE is provided with stops at the edge which can be adjusted for a short or long stroke, so that the carriage will traverse forward and back to suit the length of knife to be sharpened; the angle bar to which the knife is held is adjustable to different angles to grind any bevel desired on the knife; it can be set to grind parallel, or grind a knife which is wider at one end than the other; it also has the necessary adjustments to compensate for the wear of the wheel; all the sliding surfaces are accurately scraped to perfect bearing, and the reverse motion to the table is soft and free from jar.

IT IS AUTOMATIC in its operation, and after being started continues to run until the knife is ground to a perfect edge.

THE TIGHT AND LOOSE PULLEYS are 10″ × 3″, and should run 260 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 33″ × 82″.



No. 2 Improved Automatic Cup-Wheel Knife and Bar Grinding Machine.

Export Shipping Weight, 1,700 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 95 Feet.

Cable Word, 24″ Machine, GANANOQUE.

Cable Word, 36″ Machine, GYPSIE.

Cable Word, 48″ Machine, GOPPA.

Cable Word, 60″ Machine, GANTE.

Cable Word, 72″ Machine, GANDES.

No. 2 Improved Automatic Cup-Wheel Knife and Bar Grinding Machine.

Export Shipping Weight, 1,700 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 95 Feet.
Cable Word, 24″ Machine, GANANOQUE.
Cable Word, 36″ Machine, GYPSIE.
Cable Word, 48″ Machine, GOPPA.
Cable Word, 60″ Machine, GANTE.
Cable Word, 72″ Machine, GANDES.

THIS ENGRAVING represents our No. 2 Improved Automatic Cup-Wheel Knife and Bar Grinding Machine, which has been designed to cover a very wide range of uses. It is the most complete and reliable machine offered for accurately grinding the cutting edges of knives used in wood-working machines of every description, paper and tobacco cutting knives, bars, die-blocks, etc. It is simple and substantial, easily taken care of, and for reducing cutters to a sharp, keen edge, it has no equal. Long knives, such as used in hoop, veneer, tobacco and paper cutting machines, can be ground on both the face sides, and cutting edges, making them perfectly straight and true, so that where more than one knife is used together they will register alike. Old knives can be ground equal to new at a small cost. It will grind short or long knives with equal success. For grinding short knives a number are placed into the machine at one time.

IT IS built in five sizes to grind knives up to 24″, 36″, 48″, 60″, and 72″ long.

THE FRAME is a heavy casting in one piece, of neat design, with cored center and a broad floor base to stand firm, free from vibration when in motion.

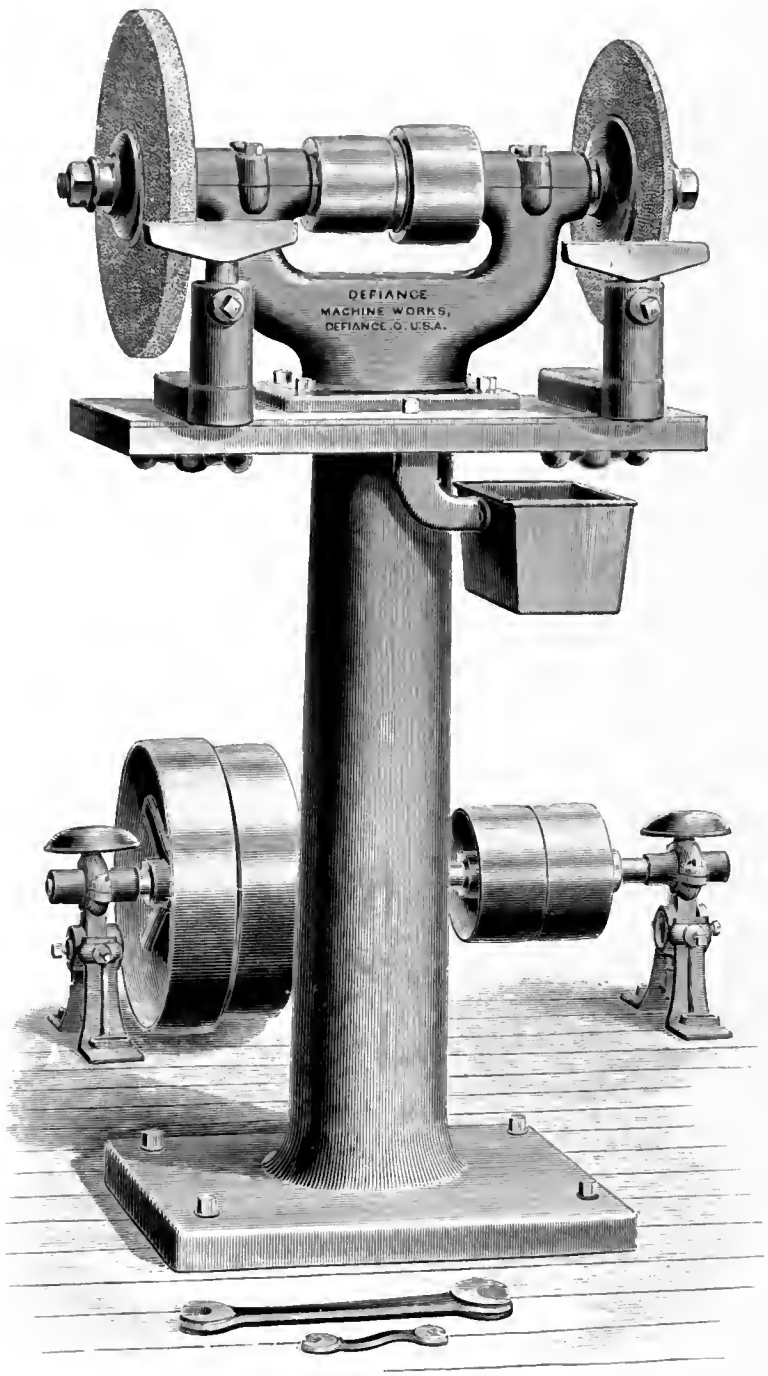
THE CUP EMERY WHEEL is 12″ outside diameter, 9⅜″ inside diameter, 5″ deep, and it is held in a circular chuck, which is opened and closed by turning a steel ring which is fitted with a screw on the outside of the chuck. By this device the emery ring is securely and accurately held in position, and as fast as the emery wheel wears it can be set out until entirely consumed.

THE ARBOR which supports the chuck and emery ring, of steel, large in diameter, runs in long bearings which are equipped with dust-proof, self-oiling devices.

THE TABLE is provided with stops at the edge, which can be adjusted for a short or long stroke, so that the carriage will traverse forward and back, to suit the length of knife to be ground. The angle bar to which the knife is held is adjustable to different angles to grind any bevel desired on the knife. It can be adjusted to grind parallel, or grind a knife which is wider in the center than at the ends, or set to a vertical plane with the face of emery wheel, and grind the face or flat sides of knives or bars, or adjusted to a right angle to grind the edges. The adjustments of this machine are such that almost any kind of surface grinding can be accomplished. All of the parts are accurately fitted, which in connection with the cut gearing used in its construction secures a soft reverse motion to the table.

THE TIGHT AND LOOSE PULLEYS are 6″ diameter, 4″ face, and they should run 1,850 rotations per minute. It is fitted with a convenient belt shipping apparatus for starting and stopping the machine.

HORSE POWER to drive, 2; floor space occupied, 46″ × 82″.



Defiance Emery Wheel Grinding and Polishing Machine.

Export Shipping Weight, 550 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 14 Feet.

Cable Word, GIANT.

Defiance Emery Wheel Grinding and Polishing Machine.

Export Shipping Weight, 550 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 14 Feet.

Cable Word, GIANT.

THIS ENGRAVING represents our new Defiance Emery Wheel Grinding and Polishing Machine, which possesses improvements over other machines intended for the same purpose. It is a most conveniently arranged tool for grinding machine knives, bits, gumming saws, and general work about a mill or factory. It will do both light and heavy work.

THE FRAME is a single casting of neat design, in pedestal form, combining neatness and convenience with great strength and solidity, its broad floor base overcoming any jar or vibration.

THE SPINDLE is made from forged steel. It is $1\frac{1}{4}''$ diameter, with the wheel ends reduced to $1\frac{1}{8}''$ diameter, both ends of which are provided with suitable collars for protecting the wheels. It runs in large, self-lubricating bearings, which are so inclosed to prevent the admission of dust or dirt.

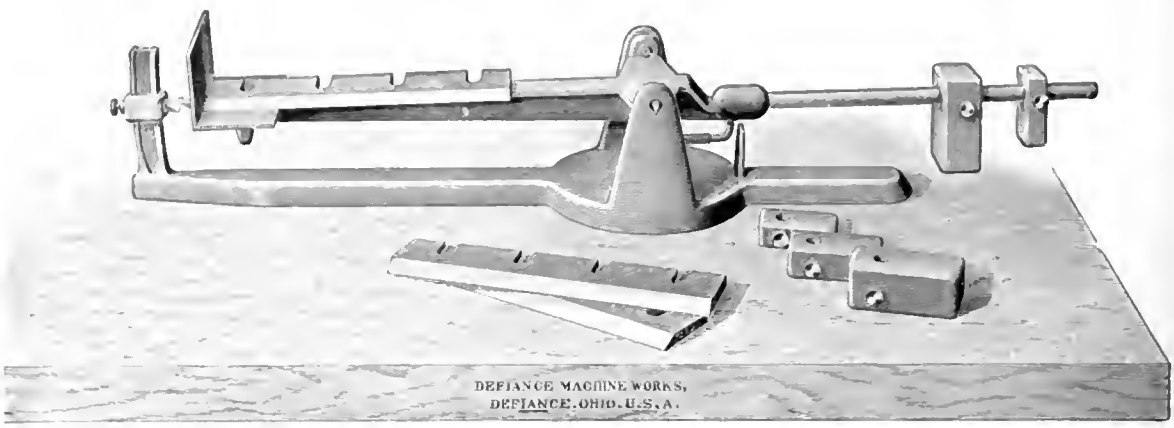
THE TABLE, of iron, is $12'' \times 24''$, planed true for the support of the tool rest, which can be instantly adjusted to any position with the emery wheels.

THE CONE PULLEY on the spindle is $4'' \times 3''$, and $5'' \times 3''$, giving two changes of speed for small or large wheels, accommodating the use of emery or buffing wheels, as large as 16" diameter, 3" face, and sizes under.

THIS MACHINE is accurately fitted in all its details, and the most exacting results can be expected from its use.

THE COUNTER is furnished as follows: Shaft, $1\frac{7}{16}'' \times 36''$; two No. 0 ball and socket adjustable drop hangers, with improved belt shipping apparatus attached; one driving pulley, $14'' \times 3''$, and one driving pulley, $15'' \times 3''$; one pair of tight and loose pulleys, 6" and 3", with loose pulley fitted with bronze bushes and self-oiling device; speed of countershaft, 480 rotations per minute, which gives 1,800 turns per minute to the machine spindle.

HORSE POWER to drive, 2; floor space occupied, $24'' \times 36''$.



Patent Proportional Knife Balancing Machine.

No. 1 MACHINE.

Export Shipping Weight, 50 Pounds.
Net Weight, 37 Pounds.
Cubic Measurement, 2 Feet.
Cable Word, BUFFALO.

No. 2 MACHINE.

Export Shipping Weight, 170 Pounds.
Net Weight, 130 Pounds.
Cubic Measurement, 6 Feet.
Cable Word, BRAVO.

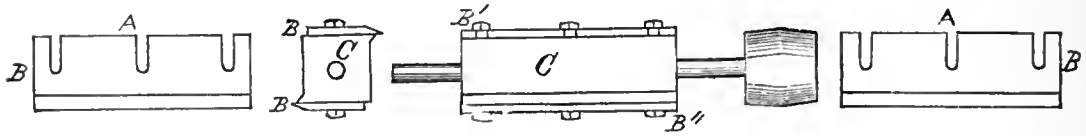


Fig. 1.

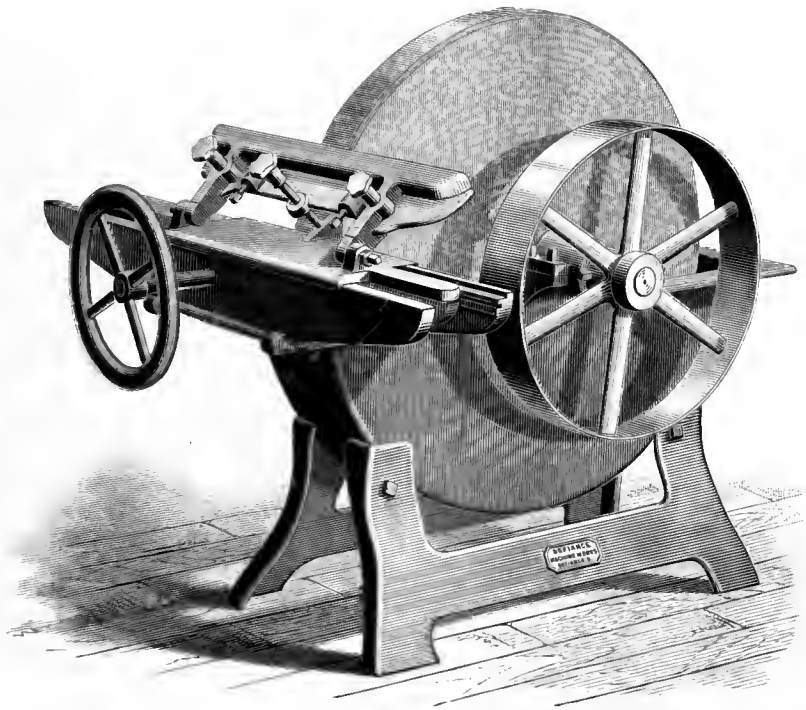
THIS ENGRAVING represents the most perfect machine yet produced for balancing moulding knives, planer knives, revolving cutters of every shape, knife screws, etc.

THIS MACHINE is too well known to the users of machine knives to require a lengthy description.

IN DESCRIBING ITS USE, let AA, Fig. 1, represent two knives, which are to be fastened on to the cutter head C. Let it be supposed the knives are of the same specific weight, but that there is an excess of weight at the opposite ends, BB; then, when revolving on the head, they will cause a violent jarring or "throwing" by reason of the excess at B′ and B″. The knives could be reduced to the same specific weight by the aid of a common grocers' scales, but that would not attain the object; by the use of the Proportional Balancing Machine, the position, as well as the amount of excess of weight, can be ascertained, so that in reducing the knives to the same specific weight, they may be made to agree in their corresponding parts. The method hitherto used is by reducing pairs or sets of knives to the same dimensions, and, by aid of common scales, to the same specific weight; but so great are the differences in the density of the parts of even the same knife, that a still running set of knives is but an accidental result.

IN OPERATING, let it be supposed that two or more knives are intended to be fastened on to one cutter head, rotating at a high velocity, and that it be conceded that they must not only be of the same specific weight, but must agree in their corresponding parts. Place each knife in succession on the platform of the Balancing Machine, with its face toward the end board, with a suitable weight at the opposite end of the beam; if, by this test, they all appear to be of the same specific weight, place them each in succession again, with their backs against the end board; they may still appear to be of the same specific weight; place them each in succession flatwise on the platform, in the many different positions of which they are susceptible, noting and reducing by an indefinite number of trials the edges, which are found to be of excessive weight, until they all are reduced to the same weight in their corresponding parts. They will also then, of course, be of the same specific weight. The balance weights are made oblong, so that by putting the heavy end up, the entire mass, consisting of weight, beam, and knife, may be poised near its center of gravity, and thereby oscillate more sensitively. If, however, the object to be balanced be very heavy, the weight must hang down, or the upper portion of the mass may preponderate. It will be seen that the operator can make the poise more or less delicate, according to the varied positions of the knives to be balanced.

No. 1 MACHINE for balancing knives up to 36″ long.
No. 2 MACHINE for balancing knives up to 48″ long.



No. 1 Improved Iron Grindstone Frame.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 32 Feet.

Cable Word, GENERAL.

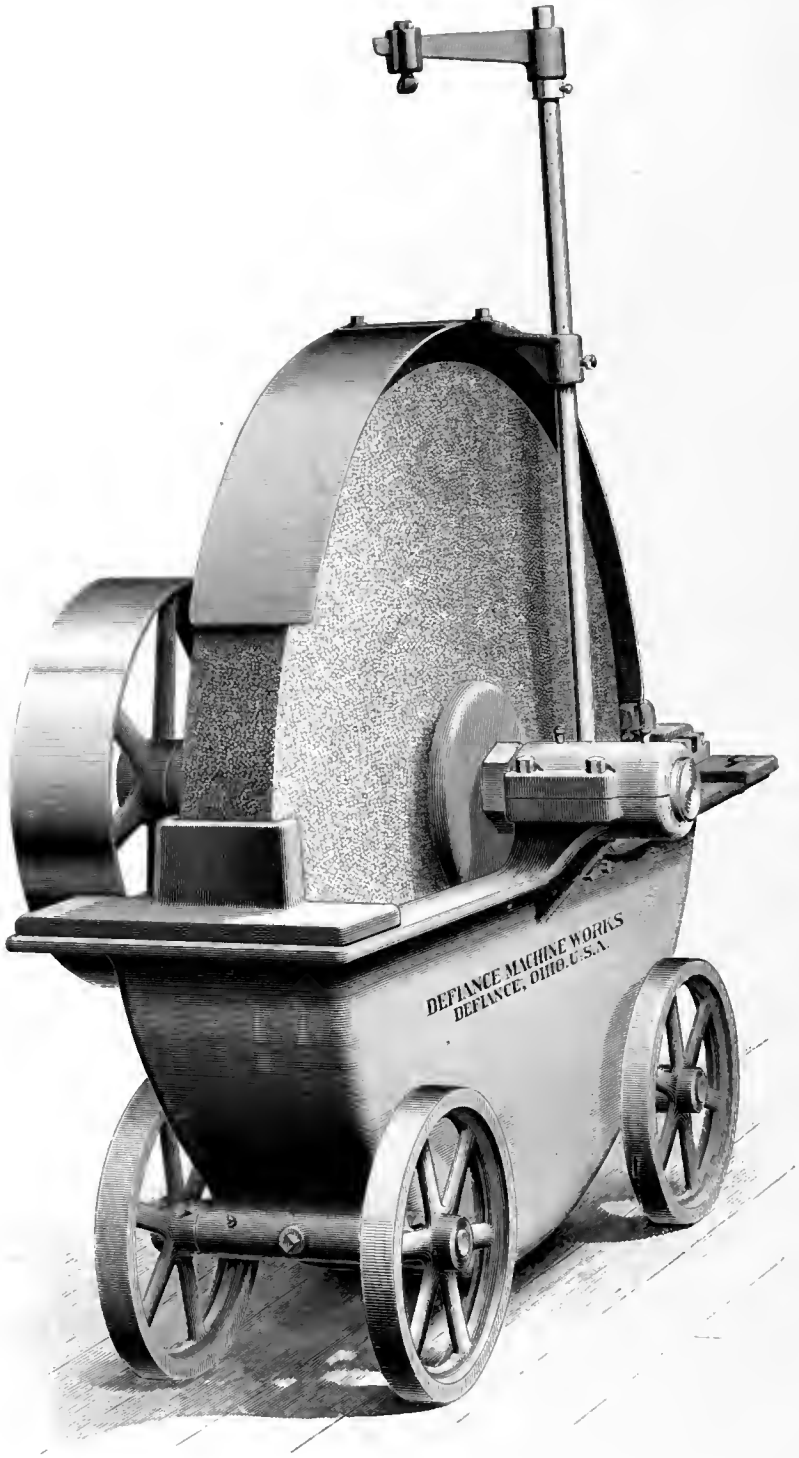
A MEDIUM PRICED MACHINE has long been desired for accurately grinding planer knives and various other edge tools. We illustrate a new machine on this page, especially adapted for the various classes of grinding required about a wood-working factory, and we believe it possesses some improvements over other machines for the same purpose. Practical experience has proved that for fine tool grinding, better results are obtained by the use of a grindstone of proper quality than by the use of an emery wheel. Too little attention has heretofore been given to the subject of grindstone machines.

THE FRAME on this machine is cast in one piece, so that no leakage or splashing of water over the floor occurs. It is neatly designed and well fitted throughout, capable of carrying a stone 32″ diameter by 3½″ face. A valve is provided for at the bottom, so that the inside of the frame can be conveniently cleansed. The spindle which supports the stone is large and conveniently arranged with flanges for clamping the stone true, and they are held and drawn together by a heavy hexagon nut, which secures the stone in a most rigid manner. The boxes are made in halves and lined with babbitt metal.

THE KNIFE GRINDING attachment is accurately planed and scraped, making the sliding carriage on it fit nicely and work with ease. The plate and jaws, which hold the knife, are hinged to the sliding carriage and can be adjusted to any angle or bevel. The knife is held firmly in the jaws, and can be adjusted to a nicety by turning the hand-screw on top, making the edge perfectly true and at any bevel. This attachment can be quickly placed on or removed from the machine.

THE MACHINE is a convenient and reliable tool, capable of grinding knives 26″ in length and sizes under.

HORSE POWER to drive, ½; floor space occupied, 26″ × 48″.



No. 2 Improved Iron Grindstone Frame.

Export Shipping Weight, 2,500 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 82 Feet.
Cable Word, GONDOLASE.

No. 2 Improved Iron Grindstone Frame.

Export Shipping Weight, 2,500 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 82 Feet.

Cable Word, GONDOLASE.

THIS ENGRAVING represents our No. 2 Improved Heavy Iron Grindstone Frame, with 48″ × 6″ grindstone. It is recommended for general factory uses for the grinding of knives, tools, etc. The grindstone furnished is free cutting, and with the stone running in water enables a large amount of work to be accomplished.

THE FRAME is cast in one piece, mounted upon wheels with an opening at the base for the removal of sediment and washing out, for which purpose it can be easily wheeled to a suitable place, or moved to tighten the belt. The wheels can be locked by the aid of a set screw when the machine is placed for use.

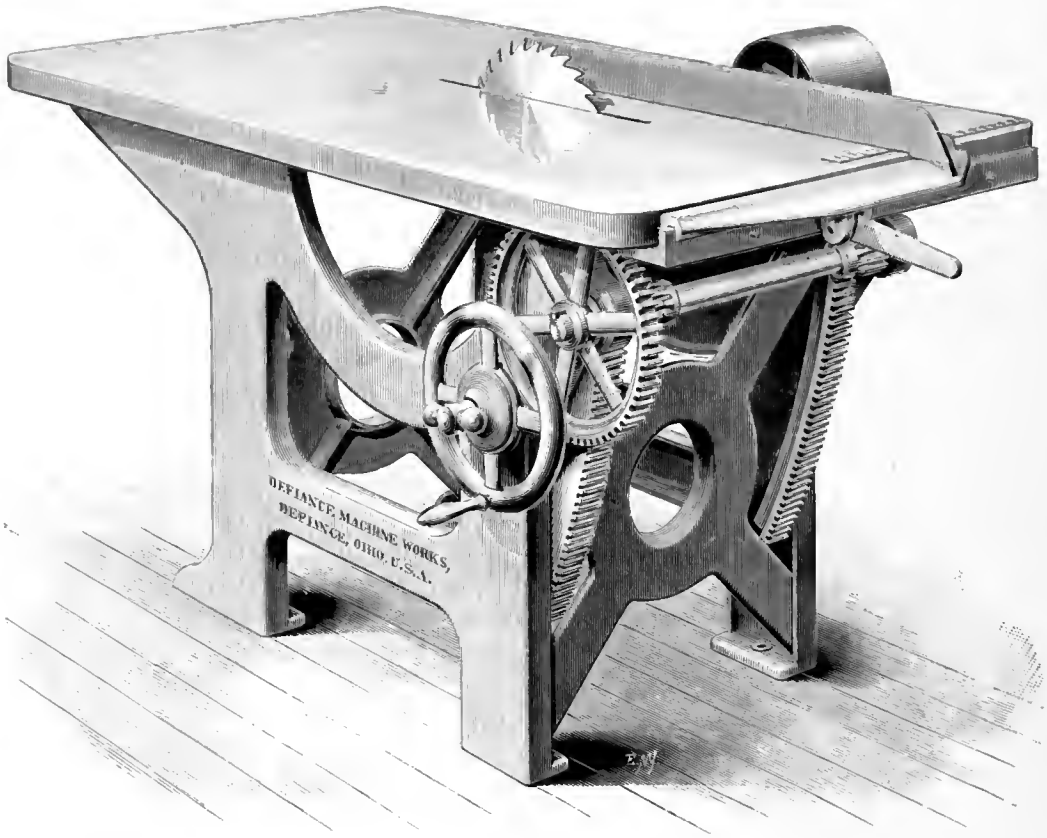
THE GRINDSTONE is 48″ diameter, 6″ face, and it is hung on a heavy, square shaft, with large journals running in self-lubricating bearings, and the stone is secured centrally in the frame with a nut and a large washer on each side.

AN ADJUSTABLE SHIELD surrounds the stone and prevents the water from rising, also the dust when the truing-off device is in use.

THE TRUING DEVICE is fitted to the rear of the frame. It consists of a slide rest carrying the tool, which is moved across the face of the stone by turning a hand-screw, thus making the stone a true circle with a smooth and straight face, in the shortest time possible.

THE DRIVING PULLEY is 24″ diameter, 6″ face, and it should run 60 turns per minute.

HORSE POWER to drive, ¾; floor space occupied, 36″ × 60″.



No. 2 Patent Hand-Feed Ripping Saw.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 61 Feet.

Cable Word, SITTING.

No. 2 Patent Hand-Feed Ripping Saw.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 61 Feet.

Cable Word, SITTING.

THIS ENGRAVING represents our No. 2 Patent Hand-Feed Ripping Saw, a medium sized machine, intended for sawing either hard or soft wood, taking a 20″ saw at the largest, which will saw through material 7″ thick and under, up to 17″ wide and narrower, and it is recommended for general ripping within these sizes, covering all the general requirements for planing mills, furniture factories, wagon, carriage, shaft, pole, bending, agricultural implement works, and pattern shops.

THE FRAME, of iron, is heavy and substantial, of neat design, and provided with a broad floor support.

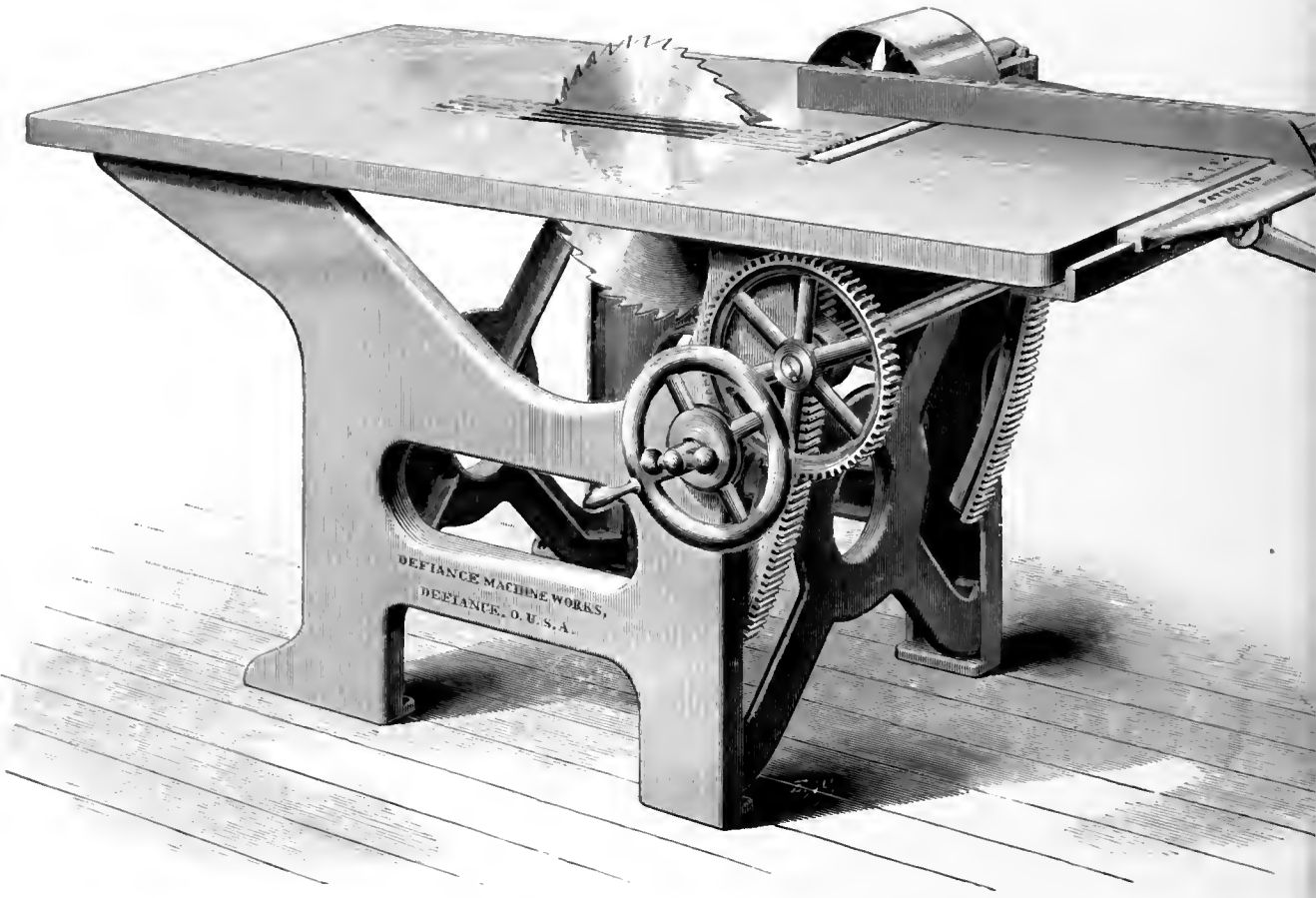
THE TABLE, of iron, is 30″ wide, 60″ long, cast in one piece and planed smooth and true over the top surface. It is fitted with a hand-wheel and cut gearing for raising and lowering the table. It can be raised clear of the saw, giving free access to the mandrel, and it is provided with a friction binder to hold the table firmly when raised.

THE PATENT FENCE can be quickly set to a scale in the table any desired distance from the saw, from 0 to 17″, for gauging the width of the lumber to be cut, and it can be instantly locked firmly in any position by a friction grip.

THE SAW ARBOR, of hammered steel, $1\frac{7}{16}$″ diameter, runs in long, genuine babbitt metal, self-lubricating bearings, which are cast together, independent of the main frame of the machine, and provided with adjustments to give the saw more or less lead.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ × 48″; two No. 2 ball and socket adjustable drop hangers; driving pulley, 20″ × 6″; tight and loose pulleys, 12″ × 6″; speed, 800 turns per minute. Pulley on arbor, 8″ × 6″; speed, 2,000 revolutions per minute. Also rack and pinion adjustable belt shipper is supplied.

HORSE POWER to drive, 4; floor space occupied, 42″ × 60″.



No. 3 Patent Heavy Hand-Feed Ripping Saw.

Export Shipping Weight, 1,900 Pounds.

Net Weight, 1,500 Pounds.

Cubic Measurement, 92 Feet.

Cable Word, SAVIOR.

No. 3 Patent Heavy Hand-Feed Ripping Saw.

Export Shipping Weight, 1,900 Pounds.
Net Weight, 1,500 Pounds.
Cubic Measurement, 92 Feet.
Cable Word, SAVIOR.

THIS ENGRAVING represents our No. 3 Patent Heavy Hand-Feed Ripping Saw, intended for either light or heavy ripping in hard or soft wood, taking a 24″ saw at the largest, which will saw through material 10″ thick and under. The fence can be adjusted from 0 to 20″ from the saw for sawing lumber of different widths. It is especially intended for heavy ripping such as required in hard wood mills, car and railroad shops, wagon and agricultural implement works, where the principal sawing is in hard wood.

THE FRAME, of neat design, is cast cored style, well braced and provided with a broad floor support.

THE TABLE is 36″ × 72″, of iron, cast in one piece, planed true and finished over the entire upper surface. In front of the saw it is fitted with a friction roller, with a vertical adjustment to prevent undue friction to the material on the table as the lumber is passing through the machine. The front end of the table is provided with hand-wheel and cut gearing for raising and lowering the table. It can be lifted any desired height clear of the saw, giving free access to the mandrel for changing saws.

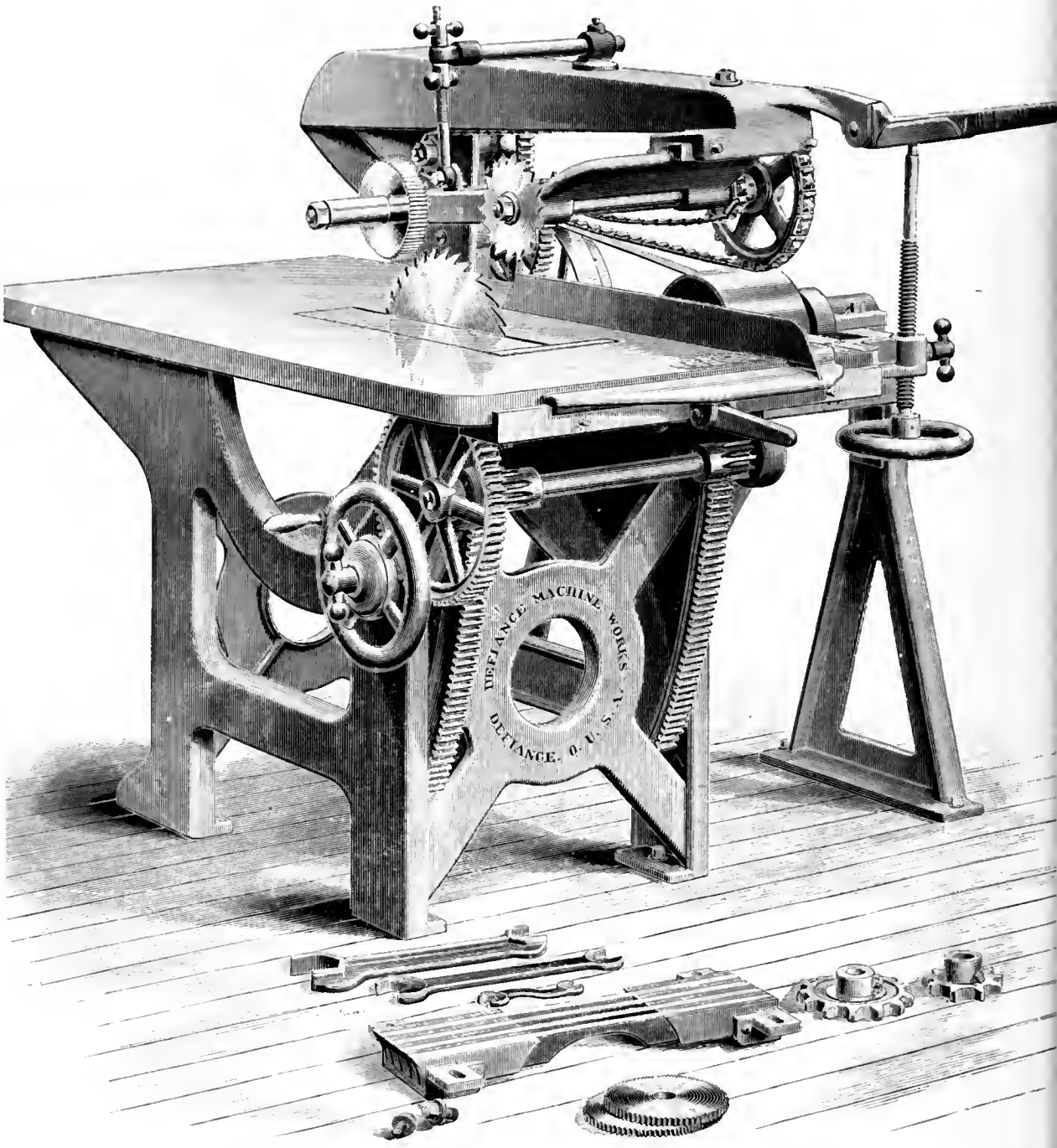
THE SAW ARBOR, of hammered steel, is $1\frac{5}{16}$″ diameter. The saw end is usually furnished to carry one saw, but it can be fitted, when so ordered, with an extended end and our new system of adjustable collars for carrying a gang of saws. In this case the table is cut out around the saw and filled in with adjustable steel bars to go between the saws for the support of the lumber. By this device the saws can be set from $\frac{1}{16}$″ up to 3″ apart with any variations between these sizes, with the same collars, a convenient arrangement for cutting several strips at one time.

THE ARBOR BOXES are provided with three bearings, one outside the driving pulley to properly support the arbor to withstand heavy work. All the bearings are cast together forming a heavy yoke, which is independent of the main frame of the machine, and provided with adjustments to give more or less lead to the saw.

THE PATENT FENCE can be instantly set to a scale in the table a desired distance from the saw, from 0 to 20″, and it can be rigidly locked in position by a friction binder.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ × 48″; two No. 2 ball and socket adjustable drop hangers; driving pulley, 30″ × 8″; tight and loose pulleys, 14″ × 8″; speed, 600 turns per minute; pulley on arbor, 10″ × 8″; speed, 1,800 rotations per minute. Also a convenient rack and pinion adjustable belt shifter is furnished.

HORSE POWER to drive, 4; floor space occupied, 58″ × 72″.



No. 2 Patent Power-Feed Ripping Saw.

Export Shipping Weight, 2,200 Pounds.

Net Weight, 1,700 Pounds.

Cubic Measurement, 68 Feet.

Cable Word, SARONY.

No. 2 Patent Power-Feed Ripping Saw.

Export Shipping Weight, 2,200 Pounds.
Net Weight, 1,700 Pounds.
Cubic Measurement, 68 Feet.
Cable Word, SARONY.

THIS ENGRAVING represents our No. 2 Patent Power-Feed Ripping Saw, a medium sized machine intended for rapid and accurate sawing in either hard or soft wood, taking a 20″ saw at the largest, which is capable of sawing through 7″ material and under, making a very desirable machine for general ripping, suited for planing mills, furniture, sash, door and blind factories, wagon, carriage, shaft, pole, bending, and agricultural implement works. It is fitted with an extended saw arbor, with collars of different thicknesses so that one, two, three, or four saws can be used at one time for the purpose of doing general sawing, or sawing a number of pieces at one time.

THE FRAME is cast coved style, of neat design, well braced and provided with a broad floor base to stand firm.

THE TABLE is 30″ wide, 60″ long, cast in one piece, planed true and finished over the entire surface, and it is fitted with an adjustable roller in front of the saw to avoid friction as the material passes over the table. The opening around the saw is large and fitted with adjustable tool steel bars which can be set to accommodate the use of one or more saws to fill the space between them. The rear end of the table is fitted to a heavy steel shaft forming a hinge joint, while the front end is provided with hand-wheel and gearing for raising and lowering the table. It can be lifted any desired height, clear of the saw, giving free access to the mandrel for changing the saws. The entire feeding mechanism raises and lowers with the table without disconnecting any of its parts.

THE SAW ARBOR, of hammered steel, is $1\frac{3}{16}$″ in diameter. It runs in long, genuine babbitt metal, self-lubricating bearings. The saw end is fitted with a novel system of collars so constructed that one or a gang of saws can be used, and, when more than one saw is used, they can be set with the same collars, from $\frac{1}{16}$″ to 3″ apart, and any adjustment between these sizes in $\frac{1}{16}$″ variations, a desirable feature in cutting strips of different widths. The steel bars between the saws have the same adjustment.

THE SAW ARBOR BEARINGS consist of three boxes, one outside the driving pulley. They are all cast together, independent of the main frame of the machine, with adjustments to give the saw more or less lead.

THE FEEDING ARRANGEMENT is hinged to a heavy steel shaft at the rear of the frame, the front end resting upon a vertical screw to raise and lower the feed-rolls for thick or thin material. The short hand lever extending beyond the screw is provided with a knuckle joint giving an automatic adjustment to the feed-rolls of several inches for varying thicknesses of lumber. By a downward pressure of the operator's hand upon this lever the feed can be lifted entirely off the material and the feed stopped at any point. The entire feeding arm can be lifted back clear of the table, out of the way, and the machine used as a hand-feed ripping saw, if desired.

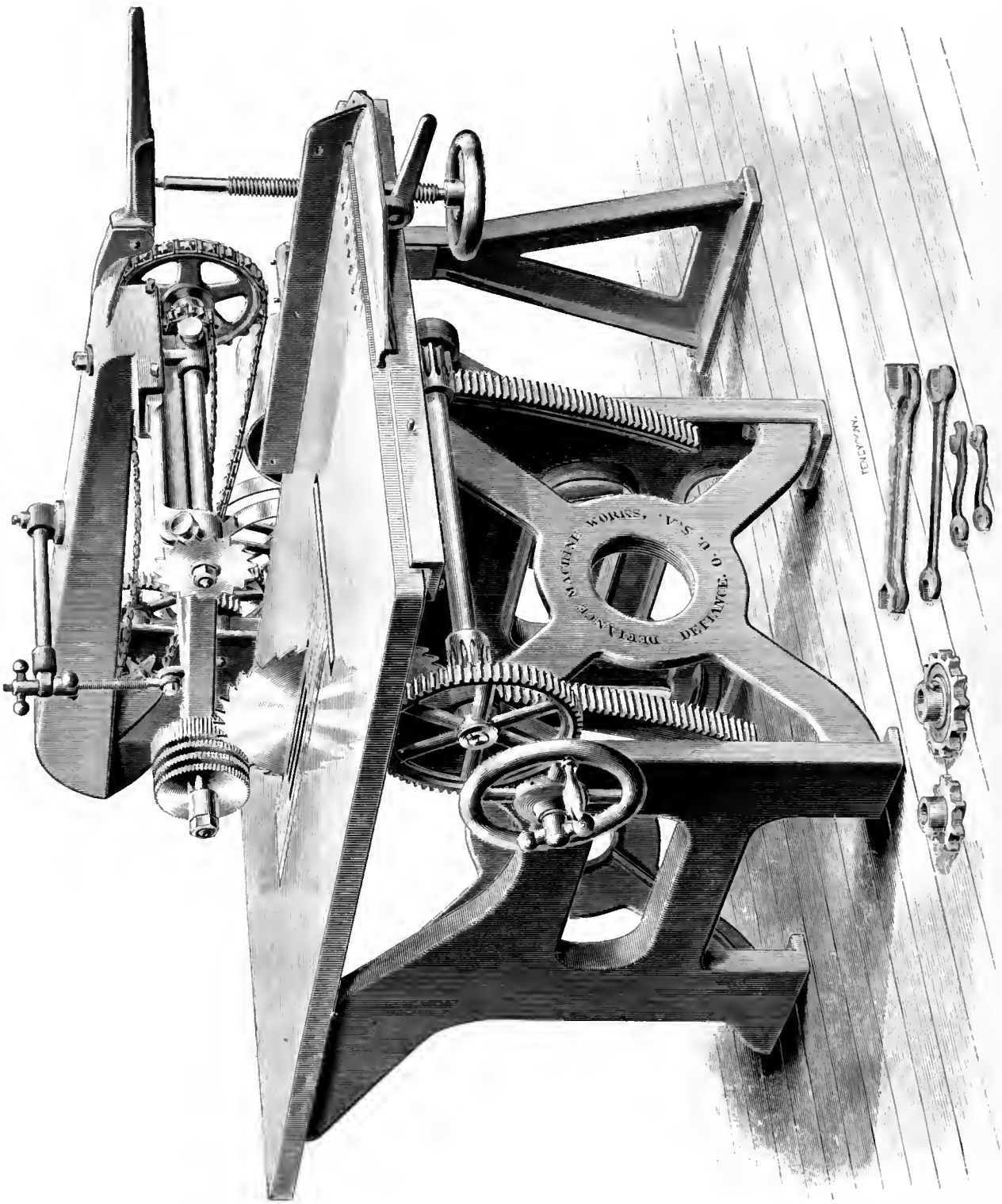
THE DOUBLE FEED is powerful; it is driven by cut gearing and link belt which forms a positive motion, entirely overcoming slippage, and it can be changed to feed from 50 to 120 feet per minute. It is provided with adjustments to keep the feed-rolls in line with the saw. The feed-rolls are close up to the saw to handle material as short as 14″ and longer.

THE PATENT FENCE can be instantly set to a scale in the table any desired distance from the saw from 0 to 17″ wide, and it can be locked in position by a quick acting friction lever.

A RESAWING ATTACHMENT is furnished, when so ordered, which can be quickly attached to the regular fence, and with it straight or beveled sawing can be successfully accomplished.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ × 60″; two No. 2 hangers; tight and loose pulleys, 12″ × 6″; driver, 20″ × 6″; speed 800 rotations per minute; pulley on arbor, 8″ × 6″; speed, 2,000 rotations per minute.

HORSE POWER to drive, 6; floor space occupied, 60″ × 60″.



No. 2 Patent Heavy Power Feed Ripping Saw

No. 3 Patent Heavy Power-Feed Ripping Saw.

Export Shipping Weight, 2,900 Pounds
Net Weight, 2,300 Pounds.
Cubic Measurement, 97 Feet.
Cable Word, STAPLE.

THIS ENGRAVING represents our No. 3 Patent Heavy Power-Feed Ripping Saw of new design. It contains many advantages and conveniences not found in machines heretofore offered. It is especially intended for heavy ripping, such as required in car and railroad shops, hard wood mills, wagon and agricultural works, where the principal sawing is in hard woods. It is equally well adapted to the lighter kinds of work.

THE FRAME is heavy and substantial throughout, cast cored style, well braced and provided with a broad floor support.

THE TABLE is 72″ × 36″, of iron, cast in one piece, planed true and finished over the entire surface. In front of the saw it is fitted with a friction roller having a vertical adjustment to allow the material to pass over the table with the greatest ease. The rear end of the table is attached to a heavy steel shaft, forming a substantial hinged joint, and the front end is provided with hand-wheel and gearing for raising and lowering the table. It can be lifted any desired height clear of the saw, giving free access to the mandrel for changing saws. The entire feeding mechanism raises and lowers with the table so that no disconnecting of its parts are necessary in making the adjustment.

THE SAW ARBOR, of hammered steel, is $1\frac{15}{16}$″ diameter and it runs in long, genuine babbitt, self-lubricating bearings. The saw end is fitted with a novel system of collars so constructed that one or a gang of saws can be used, and secure an adjustment for setting the saws from $\frac{1}{16}$″ to 3″ apart, with any variation between these sizes, with the same collars, for the purpose of ripping strips of different widths. The opening in the table around the saws is provided with adjustable tool steel bars, which can be set to accommodate various adjustments of the saw.

THE ARBOR BOXES are provided with three bearings; one outside of the driving pulley to properly support the arbor to withstand the heavy labor expected of it. All the bearings are cast together in the form of a heavy yoke, which is independent of the main frame of the machine, and provided with adjustments to give more or less lead to the saw.

THE FEEDING ARM is hinged to a heavy steel shaft at the rear of the frame, the front end resting upon an adjusting screw to raise and lower the feed spurs for thick or thin material. The short hand lever projecting beyond the screw is provided with a knuckle joint, thus securing an automatic adjustment of several inches for varying thicknesses of material, and by a downward pressure of the operator's hand upon the lever the feeding spurs can be lifted entirely off the material and stop the feed at any point. The entire feeding arm can be lifted back clear of the table for the purpose of using the machine as a hand-feed ripping saw, which is desirable for some classes of work.

THE DOUBLE FEED is very powerful. It is driven by a train of cut gears and link belt which forms a positive motion, entirely overcoming slippage, and it can be set to feed from 50 to 120 feet per minute. A 24″ saw can be used: it will cut through material 10″ thick. The feeding-rolls are close up to the saw to handle short or long material, which is fed in, and clear out of the machine.

THE PATENT FRICTION FENCE can be instantly set to a scale cut in the table any desired distance from the saw from 0 to 20″ wide. It can be locked at any position by a quick acting friction binder.

A RESAWING ATTACHMENT is furnished, when ordered, which can be instantly attached to the regular fence, and with it straight or beveled sawing can be successfully accomplished.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ × 60″; two No. 2 hangers; tight and loose pulleys, 14″ × 8″; driver, 30″ × 8″; speed, 600 rotations per minute; pulley on arbor, 10″ × 8″; speed, 1,800 rotations per minute.

HORSE POWER to drive, 7; floor space occupied, 60″ × 72″.

No. 4 Power-Feed Traveling Carriage Edger.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 4,500 Pounds.

Cubic Measurement, 314 Feet.

Cable Word, EMPIRE.

No. 4 Power-Feed Traveling Carriage Edger.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 4,500 Pounds.

Cubic Measurement, 314 Feet.

Cable Word, EMPIRE.

THIS ENGRAVING represents our No. 4 Power-Feed Traveling Carriage Edger, constructed on a substantial iron frame; especially designed for edging lumber, sawing wagon and carriage poles, rim strips, and other similar work from the plank. The material can be placed on the table and sawed either parallel or tapering. It is usually built to cut material up to 16 feet in length. It can be furnished when so ordered in special lengths, either shorter or longer.

THE FRAME is of iron throughout, and it is heavy and substantial to stand the rapid work expected of it. The top is planed true to receive and keep the friction rolls, upon which the table rides, in perfect alignment. One row of the friction rolls has plain straight faces, the other is provided with grooves, and they are all fitted to steel spindles with reamed holes.

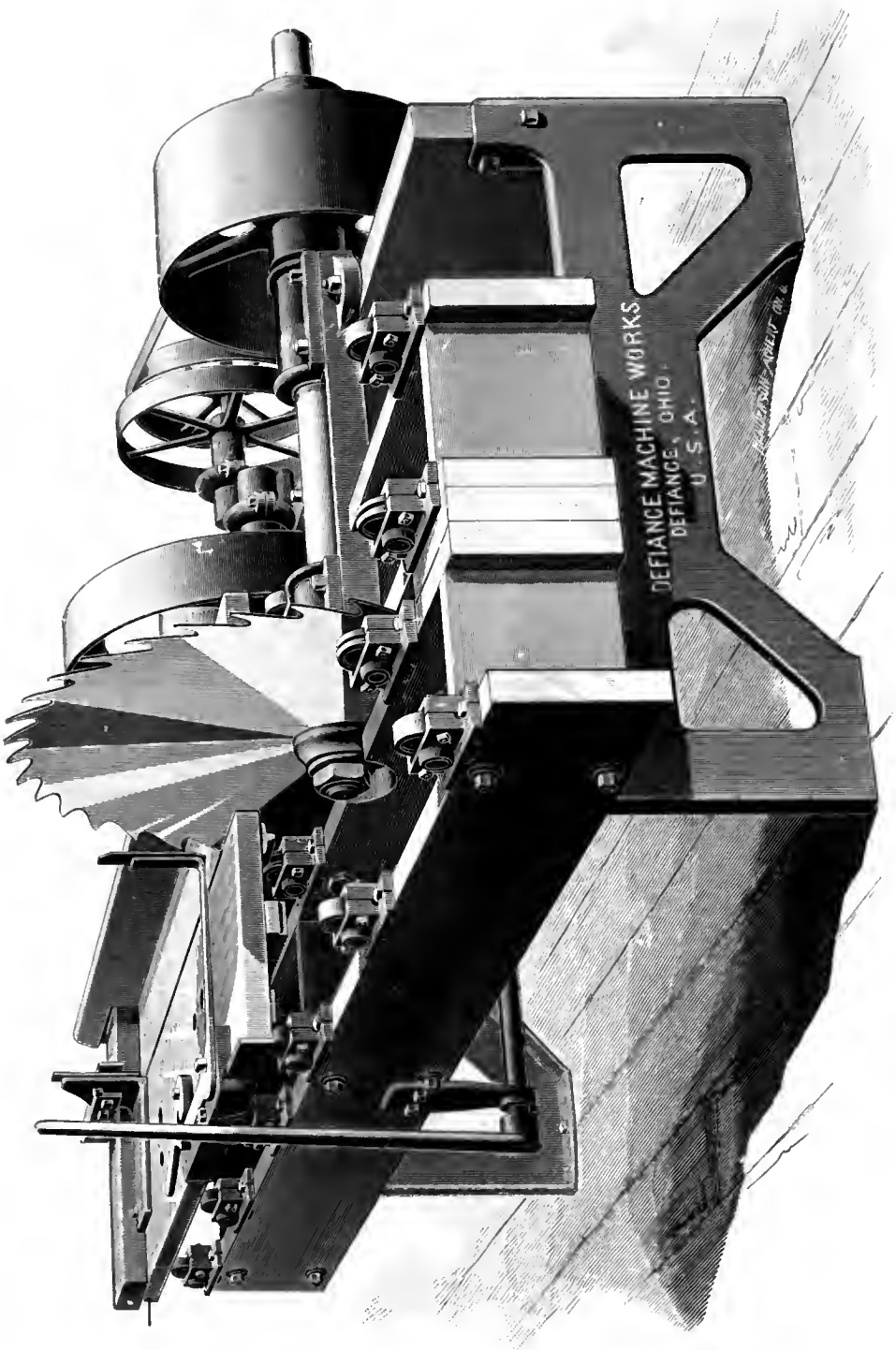
THE TABLE is built of hard wood strips bolted together and faced with steel plates on top to prevent wearing. The track on the bottom side of the table is planed true to accurately fit the faces of the friction rolls.

THE FRICTION FEED for operating the table is very powerful and noiseless in its operation, and it is of the most rapid and positive kind. The table feeds forward at the rate of 180 feet per minute, with a quick return movement of 700 feet per minute. It can be started in either direction instantly or stopped by a slight movement of the vertical lever.

THE SAW ARBOR, of steel, large in diameter, is provided with three long self-oiling connected bearings, with a driving pulley between them.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$″ diameter, 40″ long; two No. 2 ball and socket adjustable drop hangers, 14″ drop; one driving pulley, 24″ diameter, 6″ face; tight and loose pulleys, 14″ diameter, 6″ face; speed, 625 rotations per minute; pulley on arbor, 6″ × 9″; speed, 2,500 rotations per minute.

HORSE POWER to drive, 4; floor space occupied, 60″ × 180″.



No. 5 Wood Frame Short Log Sawmill and Edger.

Export Shipping Weight, 3,300 Pounds.
Net Weight, 2,300 Pounds.
Cubic Measurement, 122 Feet.
Cable Word, SALVADOR.

No. 5 Wood Frame Short Log Sawmill and Edger.

Export Shipping Weight, 3,300 Pounds.
Net Weight, 2,300 Pounds.
Cubic Measurement, 122 Feet.
Cable Word, SALVADOR.

THIS ENGRAVING represents an improved short log sawmill used for sawing short logs into plank suitable for ripping into spoke and handle squares, and preparing them for the turning lathe, or for cutting rim, shaft, pole, and other wagon and carriage stock from the log.

IT IS USUALLY built for spoke and handle factories to cut 4 feet long and shorter, and fitted with a 40″ saw, which covers all the requirements in this line, although it can be furnished to special lengths to carry a 60″ saw, if so ordered. Extra long machines of this kind are generally used as heavy edgers for trimming the edges of heavy hard wood plank.

THE TABLE upon which the material is placed while being operated upon is so constructed that it may be used as a double traveling table, or a single traveling table; when used in the latter manner the bolts are taken out of the cross tie at the rear end, and the back table is held fast by a bolt to form a stationary table to receive the sawed lumber as it falls from the saw. The use of the tables as a double traveling table is for halving or quartering logs and splitting square timber.

THE FRICTION FEED for operating the table is noiseless, and of the most rapid and positive kind, with two changes for speed from 90 feet to 100 feet per minute; it has a self-reverse at the end of the stroke, or it can be instantly reversed or stopped at any point by a slight movement of the vertical hand lever, as shown.

THE SAW ARBOR is made of hammered steel, $2\frac{7}{16}$″ diameter, with saw end reduced to 2″ diameter and provided with wrought iron saw collars, fitted with two $\frac{5}{8}$″ steel dowel pins in a 4″ circle to hold the saw.

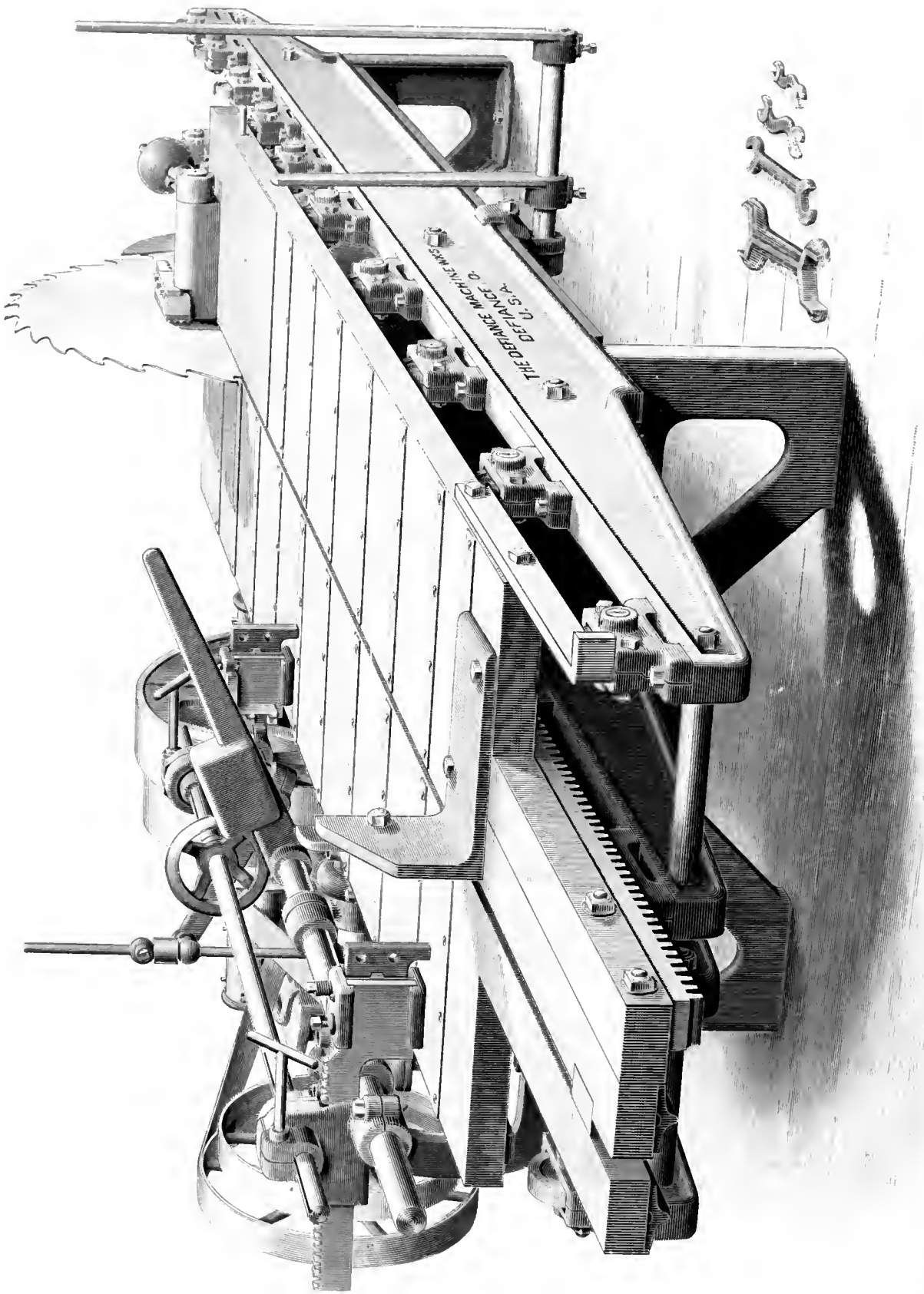
THE ARBOR BOXES are cast together in the form of a heavy bed plate to insure alignment of the bearings, which consist of genuine babbitt metal with the wearing surfaces accurately scraped to fit.

EACH MACHINE is furnished with one patent fence, which is adjustable for ripping material to different thicknesses; or a pair of dogs to grip the log at the ends, so that it can be sawed to any angle to which it may be held.

A 40″ SAW is furnished, and it will cut through material $15\frac{1}{2}$″ thick, although a larger saw, up to 60″, can be used when necessary.

A COUNTER is furnished, when ordered, as follows: Shaft, $2\frac{7}{16}$″ × 72″ long; two No. 4 J drop ball and socket adjustable hangers; two $2\frac{7}{16}$″ slip collars with headless set screws; one belt shipper complete; one driving pulley, 36″ × 10″; tight and loose pulleys, 20″ × 12″; speed, 500 rotations per minute; pulley on saw arbor, 18″ × 10″; speed, 900 rotations per minute, for a 40″ saw.

HORSE POWER to drive, 8; floor space occupied, 72″ × 96″


THE DEFIANCE MACHINE WKS
DEFIANCE O.
U.S.A.

No. 6 Iron Frame Short Log Sawmill and Edger.

Export Shipping Weight, 5,000 Pounds.
Net Weight, 4,200 Pounds.
Cubic Measurement, 156 Feet.
Cable Word, STOCK.

THIS ENGRAVING represents our new No. 6 Iron Frame Short Log Sawmill and Edger, designed for rapidly sawing logs into plank suitable for ripping into spoke and handle squares and preparing them for the turning lathe, or for cutting wagon and carriage wood stock from the log, and as a mill for getting out box boards, railroad ties and general sawing it has no equal, doing in many cases the same work that previous to its introduction required a large expensive sawmill.

IT IS regularly built to cut 6 feet long and shorter, but it can be furnished to longer lengths when so ordered. It is furnished with a 40″ saw, which will cut through material 15½″ thick, but larger sizes up to 60″ can be used.

THE FRAME, of iron throughout, is heavy and substantial to withstand the rapid and heavy labor expected of it. The top rails are planed true to keep the friction rolls that support and carry the table in perfect alignment.

THE TABLE, upon which the material is placed, is so constructed that it may be used as a double traveling table, or a single traveling table. When used in the latter manner, the bolts are taken out of the cross tie at the rear end, and the back table is held fast by a bolt to form a stationary table to receive the sawed lumber as it falls from the saw. The use of the tables as a double traveling table is for halving or quartering logs and splitting square timber.

THE FRICTION FEED for operating the table is noiseless, with a quick return, and of the most rapid and positive kind, with two changes of speed from 90 feet to 100 feet per minute. It is self-reversing at the end of the stroke, or it can be instantly reversed or stopped at any point by a slight movement of the vertical hand lever, as shown.

THE SAW ARBOR, of hammered steel, is 2 7/16″ diameter, with saw end reduced to 2″ diameter, and provided with wrought iron saw collars fitted with two ⅝″ steel dowel pins in a 4″ circle to hold the saw.

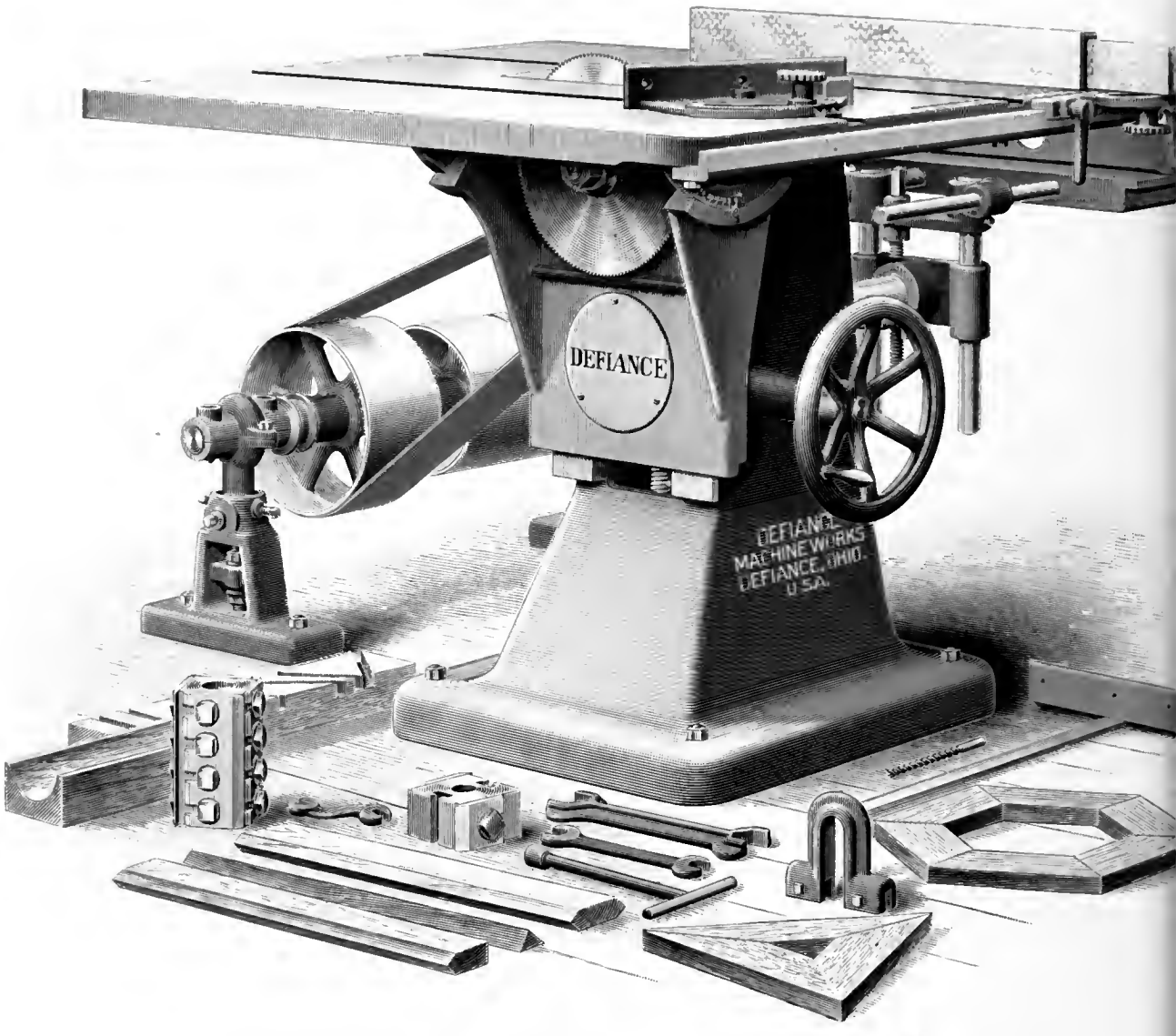
THE ARBOR BOXES are cast in the form of a heavy bed plate with three self-lubricating bearings with the driving pulley between them to insure alignment of the parts.

THE PATENT GAUGE is instantly adjustable for ripping material to different thicknesses. Their extreme ends are hinged to prevent friction against the material as it passes by the gauge.

THE SPUR DOGS are arranged to hold the material by each end. The one nearest the saw is adjustable on the table for different lengths of work, with rack and pinion movement operated by a ball lever for throwing the dogs into the work. By this arrangement the material can be sawed to any angle desired.

A COUNTER is furnished, when ordered, as follows: Shaft, 2 7/16″ × 72″; two No. 4 J Drop Hangers; two collars, 2 7/16″; one driving pulley, 36″ × 10″; tight and loose pulleys, 20″ × 12″; speed, 500 rotations per minute. Pulley on the saw arbor, 18″ × 10″; speed, 900 rotations per minute, for a 40″ saw.

HORSE POWER to drive, 12; floor space occupied, 72″ × 192″.



No. 8 Variety Sawing, Shaping and Boring Machine.

Export Shipping Weight, 1,900 Pounds.

Net Weight, 1,450 Pounds.

Cubic Measurement, 49 Feet.

Cable Word, SUNNYJIM.

No. 8 Variety Sawing, Shaping and Boring Machine.

Export Shipping Weight, 1,900 Pounds.

Net Weight, 1,450 Pounds.

Cubic Measurement, 49 Feet.

Cable Word, SUNNYJIM.

THIS ENGRAVING represents our No. 8 Variety Sawing, Shaping and Boring Machine, which has been designed for all general wood shop purposes. It will rip, miter, cross cut, groove, plane, shape, and bore, making it a most desirable combination machine for sash, door, furniture, pattern, carriage, wagon, and other shops where wood is worked.

THE COLUMN, of neat design, is a heavy casting in one piece with cored center and a wide floor base insuring rigidity.

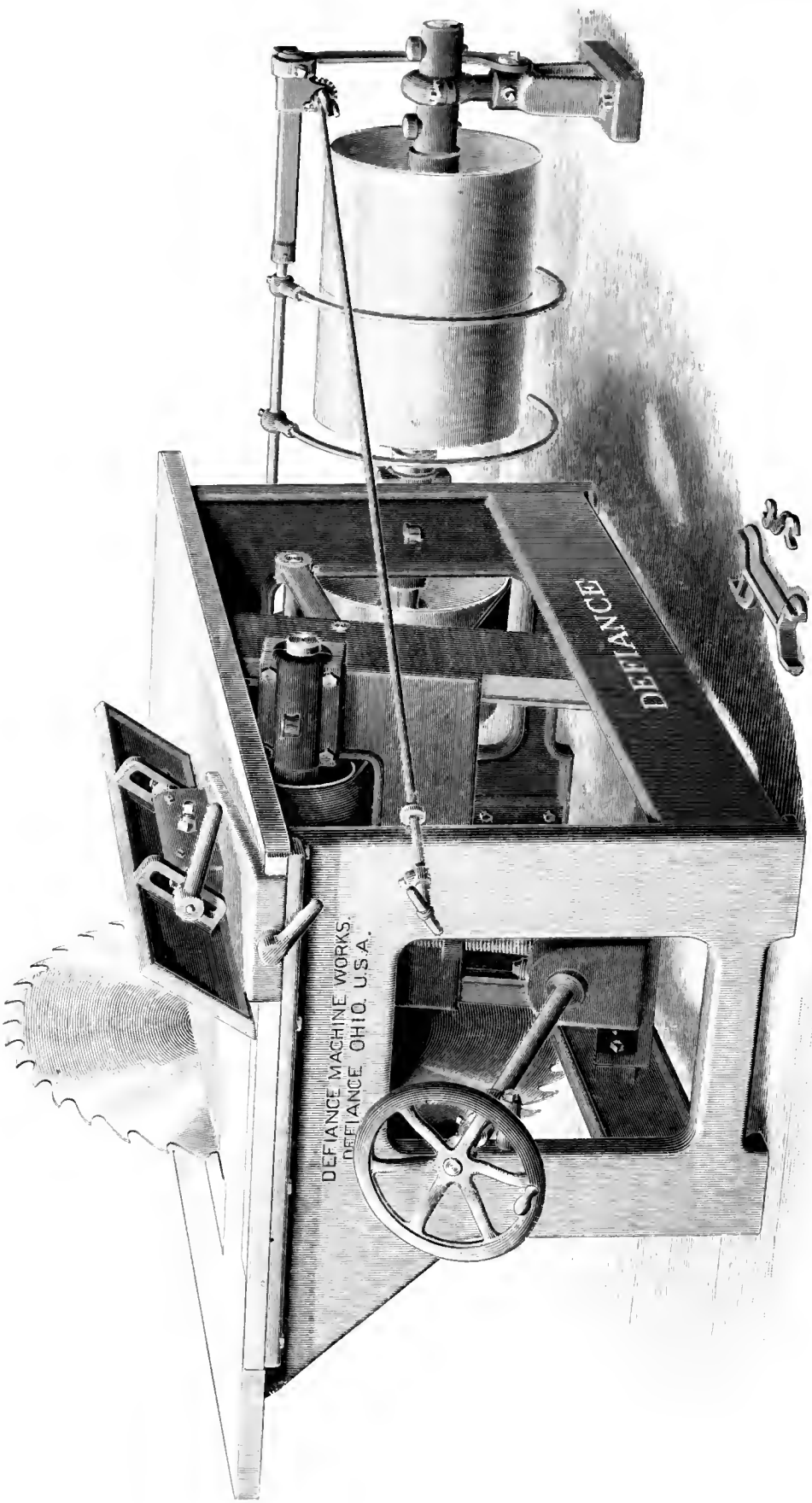
THE TABLE is 36″ × 44″, of iron, in a single piece planed true, and it can be set to a scale to varying angles up to 45 degrees for bevel and miter sawing. It is supported on a heavy frame gibbed to the side of the column and vertically adjustable to suit the thickness to be sawed by a convenient hand wheel with a screw and bevel gears. A portion of the table around the saw is removable to allow of planing, grooving, gaining, rabbeting, and other cutter heads up to 6″ wide being used. The ripping fence is gibbed to the front edge of the table, standing square or instantly set to a scale to any angle with the saw. The front edge of the table is laid off in inches and fractions to quickly set the gauge the desired distance from the saw for narrow or wide ripping without the use of a rule. The greatest distance between the saw and fence is 18″. The table has dovetailed grooves each side of the saw for cross-cut fence and miter gauges.

THE BORING TABLE, of iron planed true, is 10″ × 22″. It is fitted with an adjustable fence that can be set square or to any angle with the boring bit and to gauge the depth of boring. It will bore holes in hard or soft wood up to 10″ deep. It slides to and from the bit with the greatest ease and is adjustable vertically by a screw and hand wrench.

THE ARBOR, of ground steel $1\frac{7}{16}$″ diameter, rotates in genuine babbitt metal self-lubricating bearings. It is supplied with a 12″ cross-cut and rip saw that will saw through material $3\frac{1}{2}$″ thick; also four boring bits and one slotted cutter head with 6″ knives.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$″ × 44″; two No. 2 floor stands 20″ high; one driving pulley, 12″ × $5\frac{1}{2}$″; one pair of tight and loose pulleys, 10″ × 6″; speed, 750 rotations per minute; with the loose pulley fitted with bronze bearings.

HORSE POWER to drive, 2; floor space occupied, 90″ × 59″.



No. 9 Extra Heavy Ripping Saw.
Export Shipping Weight, 2,700 Pounds.
Net Weight, 2,200 Pounds.
Cubic Measurement, 79 Feet.
Cable Word, SUNNYSEA.

No. 9 Extra Heavy Ripping Saw.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,200 Pounds.

Cubic Measurement, 79 Feet.

Cable Word, SUNNYSEA.

THIS ENGRAVING represents our No. 9 Extra Heavy Ripping Saw, which has been designed for the heaviest and hardest service such as required by car, ship and bridge builders and general ripping in hard or soft wood. With a 40″ saw it will rip material up to 15″ thick and under, and it takes 24″ between the saw and the fence at the widest.

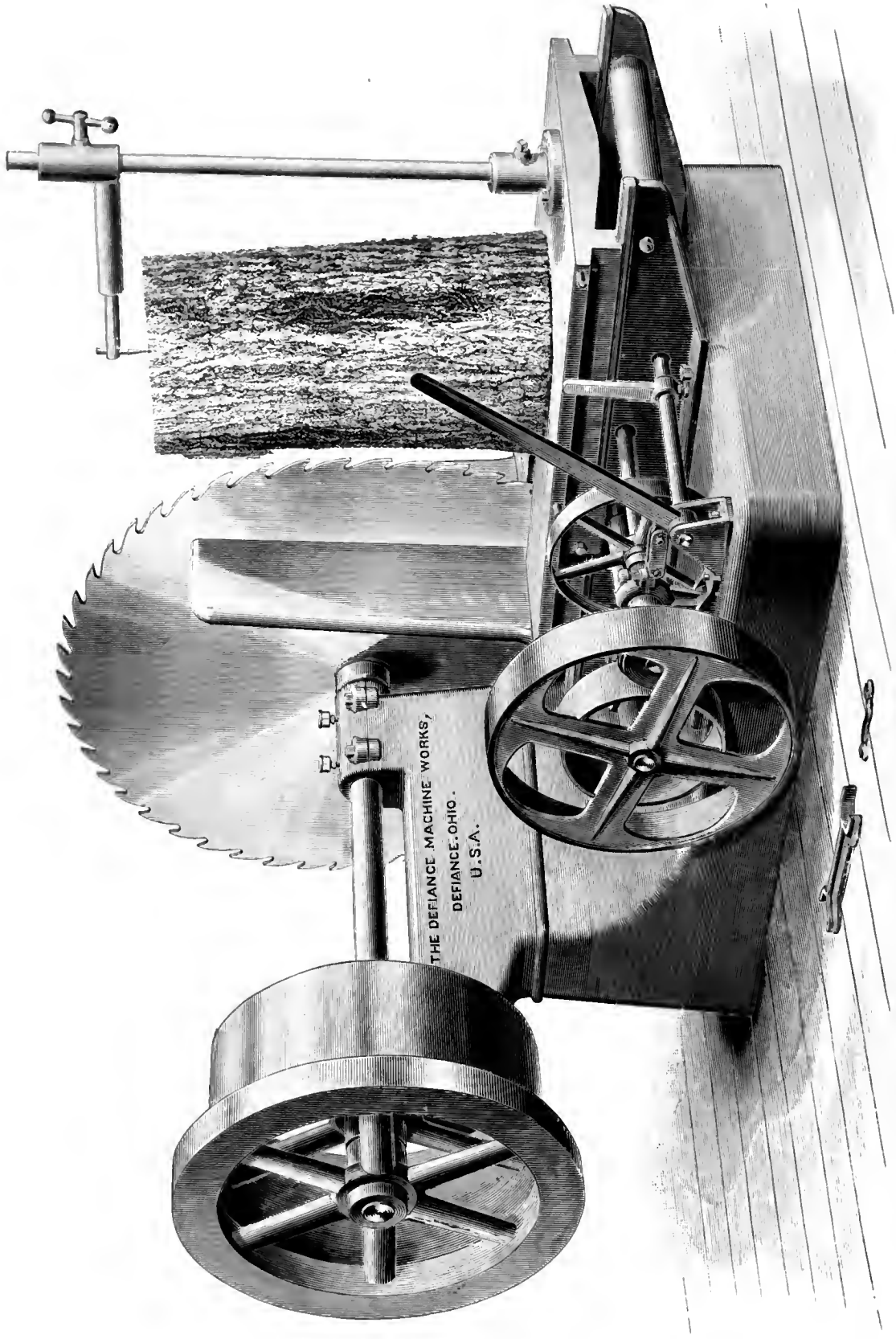
THE FRAME is heavy and substantial and provided with a table 40″ wide, 72″ long, cast in one piece, planed true on top and laid off in inches and fractions for the quick adjustment of the fence.

THE BEVELING FENCE can be instantly adjusted the desired distance from the saw without the use of a rule, and it may be set square or to any bevel up to a 45-degree angle by the use of a single lever.

THE SAW ARBOR, of ground steel 2 7/16″ diameter, rotates in long self-lubricating bearings. The saw end is reduced to 2″ diameter and fitted with steel collars and two 5/8″ pins in a 4″ circle to support the saw, and it is driven by a 10″ belt. The arbor frame is gibbed to heavy ways and it is raised or lowered by a convenient hand wheel and screw. The saw is used on the outside of the frame of the machine, and the table around the saw is fitted with a removable plate for convenience in placing the saw on or taking it off the arbor.

THE COUNTER is a part of the machine. The shaft is 2 3/16″ × 62½″ long; the tight and loose pulleys are 16″ diameter × 10″ face and should run 600 turns per minute when a 40″ saw is used. The loose pulley is fitted with bronze bearings with self-lubricating device, and they can be belted to from above or below. A convenient belt shipping apparatus is furnished, which is operated from the front side of the machine.

HORSE POWER to drive, 12; floor space occupied, 72″ × 72″.



No. 10 Improved Heavy Iron Frame Bolting Saw.

Export Shipping Weight, 6,000 Pounds.
Net Weight, 5,400 Pounds.
Cubic Measurement, 166 Feet.

No. 10 Improved Heavy Iron Frame Bolting Saw.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 5,400 Pounds.

Cubic Measurement, 166 Feet.

Cable Word, SALEO.

THIS ENGRAVING represents our new No. 10 Improved Heavy Iron Frame Bolting Saw, especially designed for splitting the sections of logs as they come from the cut-off saw, into bolts or sections, and preparing them for the shingle and heading saws and the stave cutter. Previous to the introduction of this machine, material of this class was split out by the use of a hand ax, but the uncertainty of splitting straight and true proved a serious loss, and the operation was slow and expensive. By this new machine the stock is cut smooth and true without loss, and it is in much nicer condition to go to the finishing machines.

THE FRAME of this machine is a massive casting of neat design in one piece, with cored center and a broad floor base to stand firm.

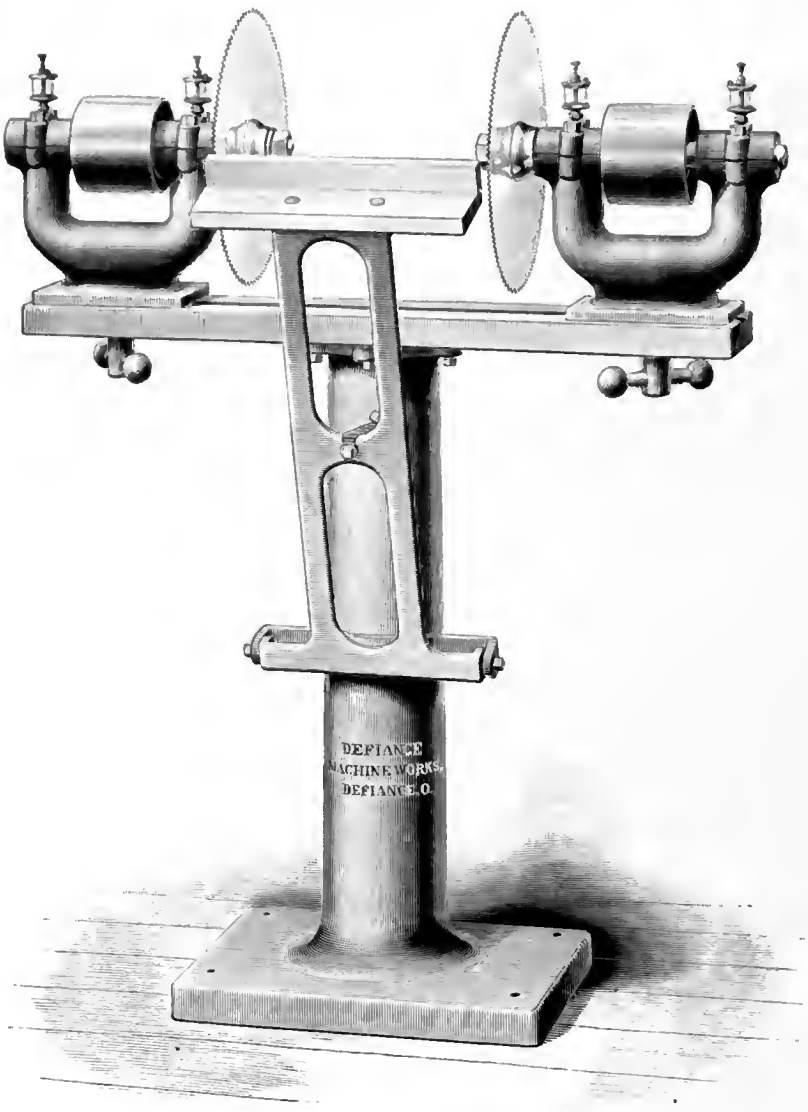
THE SAW ARBOR, of steel, is $2\frac{15}{16}$″ diameter, and it rotates in self-lubricating bearings 12″ long. The saw end is 2″ diameter and the collars are fitted with two $\frac{5}{8}$″ steel pins in a 4″ circle, and the nut for clamping the saw between the collars is finished and case hardened. The pulley on the saw arbor is 30″ diameter, 12″ face, and when a 66″ saw is used it should run 545 turns per minute.

THE TABLE, of iron, travels upon a track which is planed true and accurately scraped to bearing. It is operated to and from the saw by a power friction feed having a quick return movement. It can be started in either direction or stopped instantly by a slight movement of the vertical lever as shown. It is also fitted with automatic safety stops so that it cannot travel too far in either direction. The device for holding the log is adjustable for short or long work, and it can be quickly swung out of the way when not in use.

THE MATERIAL to be sawed is placed upon its end on the table as shown and sawed to the center, taking as many cuts around the log as is necessary to produce sections of the required size. It depends upon the size of the log. The saw should not cut clear to the center of the log at the top and bottom, thus leaving a thin shell at both ends to hold the sections together for convenience in handling. The sections can be quickly separated by striking one end of the log. In using a 60″ saw, it will cut stock 48″ long or shorter, although the machine is so constructed as to carry a saw 66″ diameter, if required.

THE COUNTER is furnished as follows, when especially ordered: Shaft, $2\frac{15}{16}$″ × 72″ long; two No. 4 ball and socket adjustable drop hangers with improved belt shipping apparatus attached; one driving pulley, 48″ × 12″; the tight and loose pulleys are 30″ × 12″, with the loose pulley fitted with bronze bearings and a self-oiling device, and they should run 375 turns per minute when a 60″ saw is used.

HORSE POWER to drive, 15; floor space occupied, 75″ × 102″.



No. 0 Improved Equalizing Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 700 Pounds.
Cubic Measurement, 38 Feet.
Cable Word, SOUTH.

THIS ENGRAVING represents an Improved No. 0 Double Equalizing Machine, which is used by the manufacturers of handles, insulator pins, etc., for the purpose of cutting off both ends of the material at one time, reducing same to exact lengths, and preparing them for the turning lathe.

IT WILL cut from 0 to 24″ long; the saws are 14″ diameter, with fine teeth, 16 gauge, and they are capable of doing smooth work.

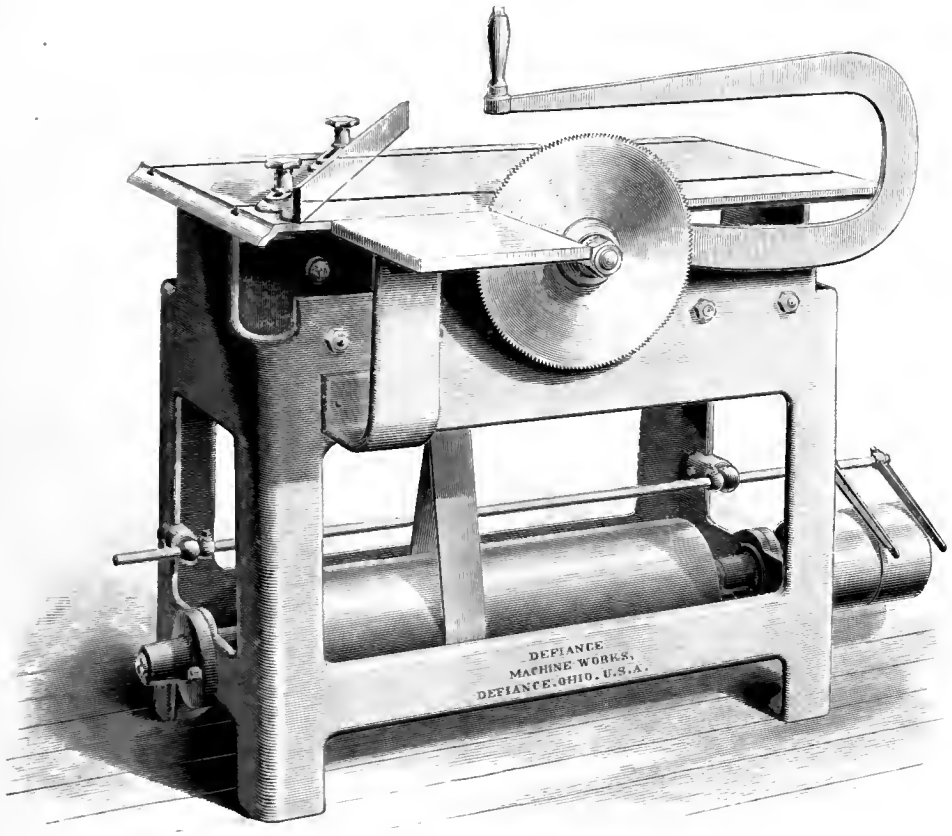
THE FRAME, being a single casting in pedestal form, combines neatness and convenience with the greatest strength and solidity; the table upon which the saw arbor boxes are placed is planed true on the top, with a tongue and groove to keep the saws in alignment; by loosening the hand-screws underneath the table the saws can be adjusted horizontally to or from each other for regulating the length of cut.

THE SAW ARBORS, of forged steel, are 1¼″ diameter and run in genuine babbitt metal self-oiling boxes. The pulleys on the arbors are 4″ diameter, 4″ face.

THE VIBRATING CARRIAGE, which supports the material while being operated upon, is hinged at the bottom, making a substantial connection entirely free from lateral motion, which prevents cramping of the material between the saws, enabling it to swing with the greatest ease.

THE COUNTER is furnished as follows: Shaft, 1 15/16″ × 80″ long; two No. 2 ball and socket adjustable drop hangers; two drivers, 16″ × 16″; one shipper complete; tight and loose pulleys, 10″ × 6″; speed, 625 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, 20″ × 48″.



No. 1 Improved Trimming Saw.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 34 Feet.
Cable Word, SAND.

THIS ENGRAVING represents a new trimming saw designed to meet all the requirements for fine and accurate sawing, chamfering, beveling, trimming off, cutting boards to exact lengths, and it is recommended for wagon and carriage manufacturers, box, furniture, sash, door, moulding, piano, and organ factories.

THE FRAME is of neat design and cast in one piece.

THE TABLE, of iron, in one piece, is 24″ × 41″; the top is planed true and provided with two T shaped slots, one on each side, running the entire length, by which to secure and adjust the fence.

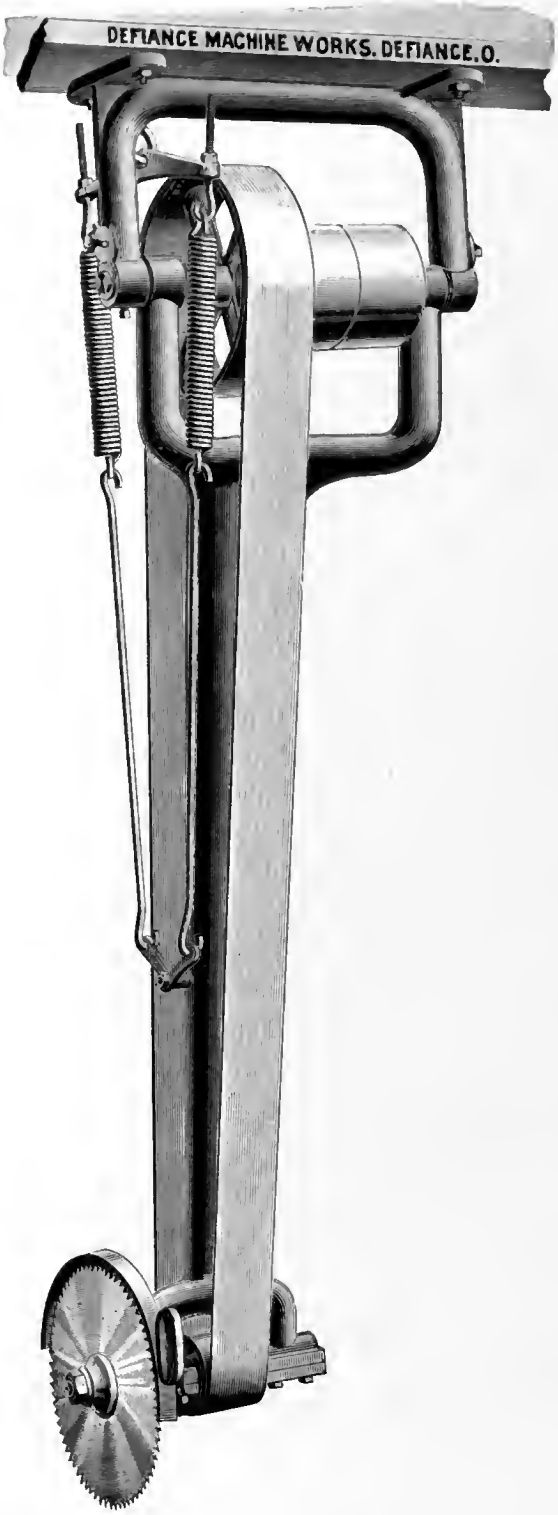
THE SAW ARBOR is $1\frac{5}{8}$″ diameter, forged steel, and it is fitted to a traveling carriage running in genuine babbitt metal self-oiling bearings.

THE ADJUSTABLE IRON FENCE is planed true and square and it can be quickly adjusted to any angle with the saw. A hard wood gauge 60″ long, laid off to inches and fractions, with an adjustable stop, is also furnished; it is used when cutting off material to exact lengths, and when in use it is screwed to the face of the iron fence and is adjustable with it.

THE OPERATION of this machine is very simple; the material is placed upon the table against the fence, the saw is then drawn to the work. The ease and firmness with which the saw works, and the material to be operated upon remaining stationary, insure accurate work. For fine and rapid sawing it has no equal. The greatest distance between the saw and fence is 24″.

THE TIGHT AND LOOSE PULLEYS are 7″ × 4″; speed, 1,400 rotations per minute; pulley on arbor, $3\frac{1}{2}$″ × 3″; speed, 3,400 revolutions per minute.

HORSE POWER to drive, 2; floor space occupied, 40″ × 60″.



No. 1 Patent Swing Saw.

Export Shipping Weight, 1,200 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 42 Feet.
Cable Word, SALLY.

No. 1 Patent Swing Saw.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 42 Feet.

Cable Word, SALLY.

THIS SAW contains several new and valuable features. The general design is original, and the workmanship is excellent. Insufficient attention has heretofore been given by the builders of wood-working machinery, to the proper construction of machines of this kind. Weights and levers have long since proved cumbersome and laborious deviees for giving self-return movement to the frame, as in each case the operator is obliged to lift the weight.

THE ENGRAVING fully explains our Patent Swing Saw, which, for beauty of design, ease and accuracy of operation, cannot be equaled by other machines of this class.

THE FRAME is cast in one piece with cored center, making it very stiff and reliable, and is hung to a steel shaft $1\frac{15}{16}$" diameter, which is supported in substantial hangers cast together in the form of a bed plate, which holds it firm and in perfect alignment.

THE PATENT SPRING BALANCES used on these machines command especial attention, for the purpose of pulling the saw back from the operator out of harm's way. The weighted balances in common use are seriously objectionable because of their great inertia and consequent resistance at both extremes of swing. It is to overcome this objection that we use the spring balances, and we find their qualities to be incomparable. The adjustments, by which a greater or less tendency backward can be secured, is another desirable feature.

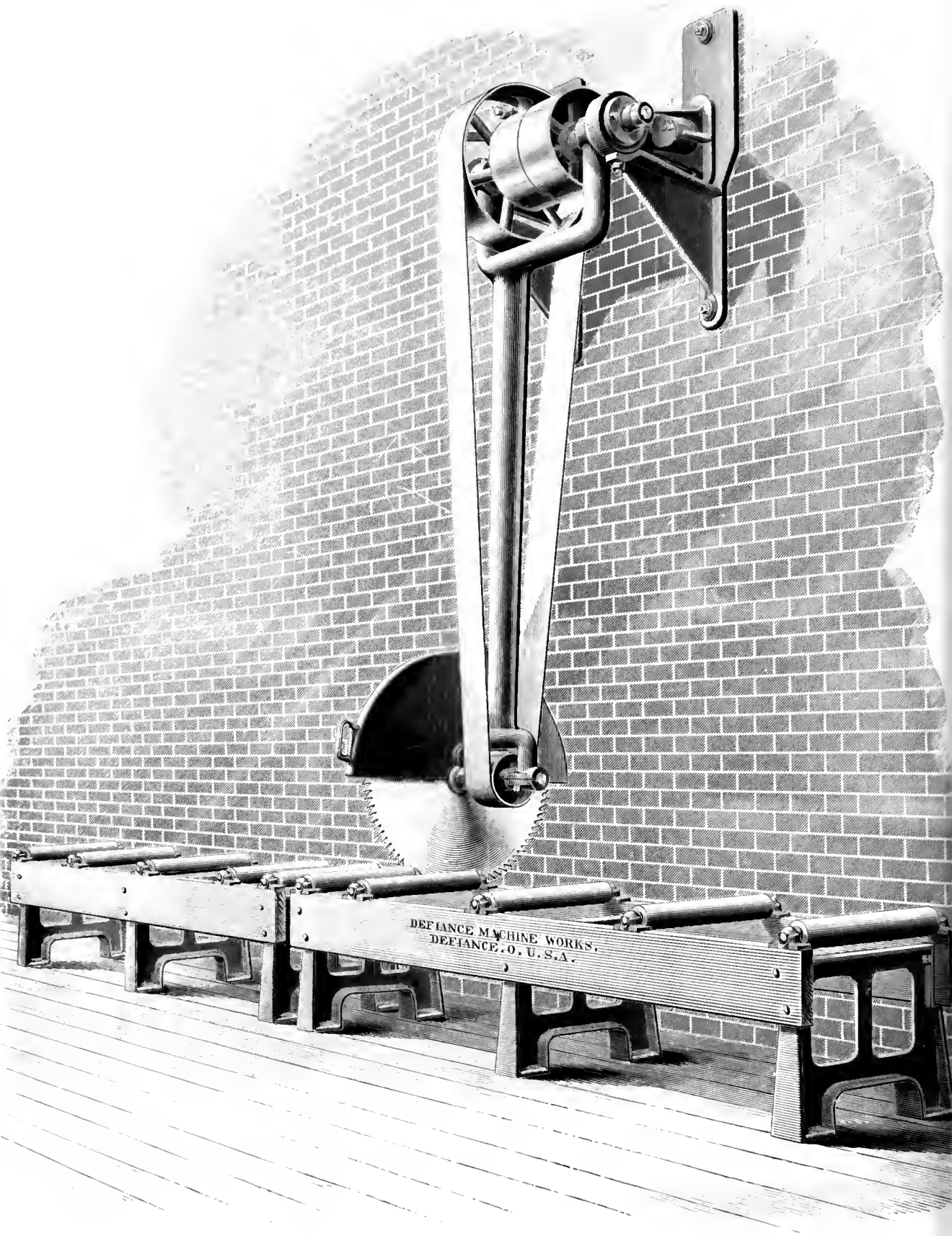
THE SAW is covered with a shield, preventing any possible chance for the operator to become injured.

THE COUNTER is properly supported at both ends, having a stationary or dead shaft. The driving pulley, 16" × 5" face, is provided with a hub of sufficient length to extend through the tight pulley; they are securely keyed together, permitting them as well as the loose pulley to run free upon the shaft, thus reducing the wear of the upper boxes to simply the amount produced by the motion of the frame. By this arrangement the frame will retain its proper firmness, free from lateral motion.

THESE MACHINES are made in various sizes, from 7 feet to 12 feet in length, to carry saws from 10" to 24" diameter. Steel spindles are used throughout, running in genuine babbitt metal bearings. They are thoroughly tested before shipping and recommended for all classes of sawing where a swing saw can be used, and are guaranteed to do perfect work. In ordering, give length from top of hanger to center of saw arbor, and size of saw required.

THE COUNTER is a portion of the machine, and is furnished with a belt shipping apparatus; the driving pulley is 16" × 5"; tight and loose pulleys, 10" × 6"; speed, 800 rotations per minute; pulley on arbor, 6" × 5"; speed, 2,130 rotations for a 16" saw.

HORSE POWER to drive, 2.



No. 2 Patent Heavy Swing Saw.

Export Shipping Weight, 3,100 Pounds.
Net Weight, 1,900 Pounds.
Cubic Measurement, 226 Feet.
Cable Word, SELVA.

No. 2 Patent Heavy Swing Saw.

Export Shipping Weight, 3,100 Pounds.

Net Weight, 1,900 Pounds.

Cubic Measurement, 226 Feet.

Cable Word, SELVA.

THIS ENGRAVING represents our Patent No. 2 Extra Heavy Swing Cut-Off Saw, which is adapted to carry a saw from 24″ up to 48″ diameter. It is capable of cutting off heavy lumber or timber, and cutting round logs to lengths suitable for converting same into hub, spoke, wagon, stave, and hoop stock.

IT IS furnished with side brackets to be suspended from the side of a wall, as shown by the engraving, or with connected hangers to fasten to the ceiling, similar to our No. 1 machine, and it is built in seven different lengths, to measure 8 feet, 9 feet, 10 feet, 11 feet, 12 feet, 13 feet, and 14 feet, from the center of the arbor to the top of the hanger.

THE FRAME is cast in one piece with cored center, making it very stiff and reliable; and it is hinged to the hanger, which prevents end wear of the hinged bearings and lateral motion to the frame.

THE SAW ARBOR, of steel, is $1\frac{1}{16}$″ diameter, running in self-oiling, genuine babbitt metal bearings, and it is driven by an 8″ belt; the saw is covered with a shield to protect the operator.

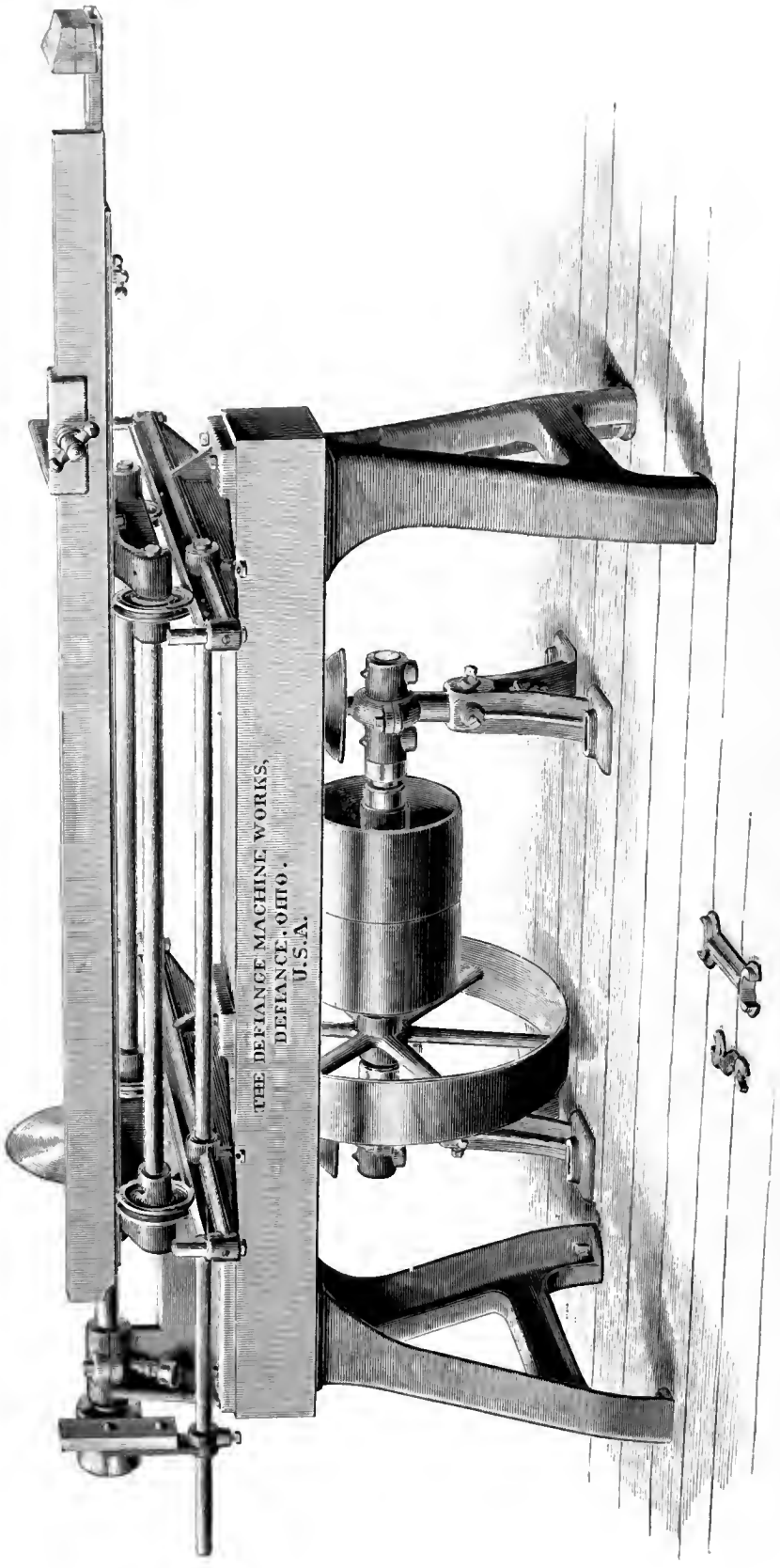
THE PATENT SPRING BALANCES used on this machine for the purpose of pulling the saw back from the operator, out of harm's way, commend special attention; the weighted balances in common use are seriously objectionable, because of their great inertia and consequent resistance at both extremes of swing; it is to overcome this objection that we use the spring balances, and we find their qualities to be incomparable; the adjustments, by which a greater or less tendency backward can be secured, is another desirable feature.

THIS MACHINE is so constructed that the operator is not obliged to lift a weight in pulling the saw forward, at the same time the saw is self-returning.

THE ROLLER TABLE can be furnished to any length required; the rolls are fitted with finished steel spindles running in bored ball and socket boxes, and the lumber can be moved over the table with the greatest ease.

THE COUNTER is a portion of the machine, and it is furnished with belt shipping apparatus; the driving pulley is 24″ diameter, 8″ face; tight and loose pulleys are 14″ diameter, 8″ face; speed, 340 rotations per minute; pulley on arbor, 8″ × 8″; speed, 1,020 revolutions for 36″ saw. In ordering give length from top of hanger to center of saw arbor, also size of saw.

HORSE POWER to drive, 4.



No. 5 Improved Cut-Off and Equalizing Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 79 Feet.
Cable Word, STANHOPE.

No. 5 Improved Cut-Off and Equalizing Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 79 Feet.

Cable Word, STANHOPE.

THIS ENGRAVING represents our new No. 5 Improved Iron Frame Cut-off and Equalizing Machine, designed for rapidly and accurately cutting off boards and strips to exact length. It is a useful machine for box makers, wagon, carriage, agricultural implement, furniture, rim, handle, and bobbin manufacturers, and various other woodworkers. It performs the work smooth and true, and it is built to any length as ordered. It is furnished to cut 8 feet long and shorter, when no special length is specified.

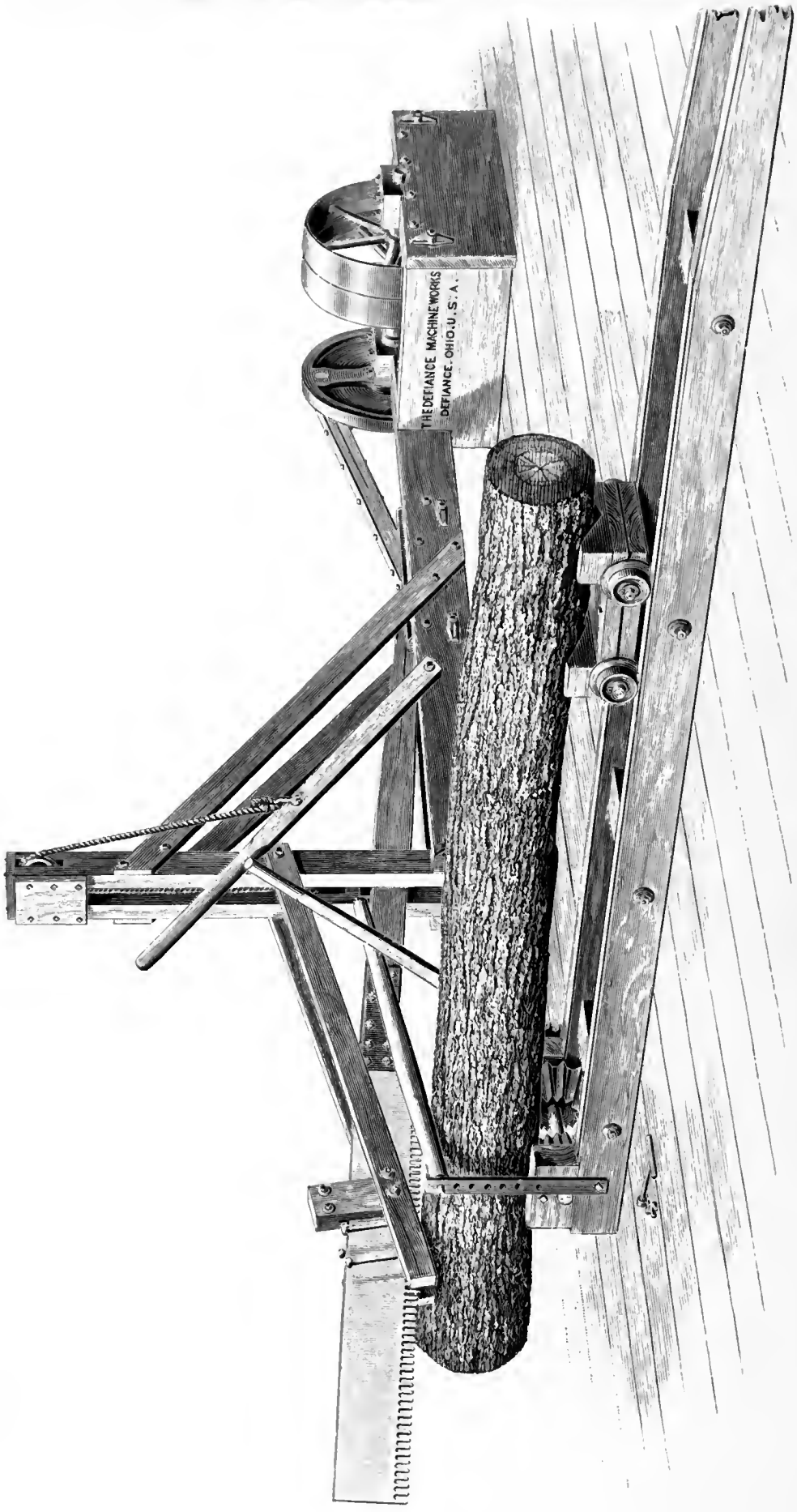
THE FRAME, of iron, is cast in one piece with cored center of neat design, and it is provided with a broad floor base to stand firm. The rails upon which the table travels are planed true and provided with rubber cushion stops at each end.

THE TABLE is provided with friction rollers which are turned true and grooved to accurately fit the track upon which they run, and it travels to and from the saw with the greatest ease. A system of gauges is provided whereby the stock to be cut off can be gauged from either end. The front gauge nearest the saw is fitted to a steel shaft and it can be quickly set for different lengths of sawing. It is more especially used for short equalizing, such as cutting bobbin and handle squares to length. The central gauge attached to the table is clamped in position by a hand screw. The edge of the table is laid off its full length in inches and fractions so that the gauge can be set to the proper distance from the saw for different lengths of sawing, without the use of a rule. This gauge is more especially intended for long work. The third gauge is mortised into the right hand end of the table; it is laid off in inches and fractions to accurately set it the desired distance from the saw, and it is used for sawing stock that is longer than the central gauge will accommodate.

THE SAW ARBOR, of steel, runs in long, self-lubricating bearings. The pulley at the end of the arbor is 4″ × 4″. The saw furnished is 12″ diameter, and it will cut off stock up to 4″ thick, and larger saws can be used, if desired.

THE COUNTER is furnished as follows: Two No. 1 ball and socket adjustable drop hangers, with new style belt shipping apparatus; the shaft is $1\frac{7}{16}$″ × 36″; one driving pulley, 24″ × 4″; the tight and loose pulleys are 10″ × 6″, with the loose pulley fitted with bronze bearings. Speed, 600 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, 43″ × 86″.



No. 1 Improved Drag Sawing Machine.

Export Shipping Weight, 3,100 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 124 Feet.
Cable Word, STOVER.

No. 1 Improved Drag Sawing Machine.

Export Shipping Weight, 3,100 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 124 Feet.

Cable Word, STOVER.

THIS ENGRAVING represents our No. 1 Improved Drag Sawing Machine, especially designed for cutting off logs of small or large diameters, either hard or soft wood, to different lengths. It is an extremely profitable machine for the makers of hubs, spokes, shafts, poles, rims, hoops, staves, heading, and other manufacturers who purchase their material in the log.

THE FRAME is constructed of heavy timbers bolted together and well braced to stand the heavy labor expected of it.

THE DRIVING POWER is placed between substantial bearings. The shaft is $2\frac{15}{16}$" diameter, and the balance wheel forming the crank to which the connecting rod attaches, weighs 350 pounds, and the sliding cross-head and other working parts are equally durable throughout.

THE SAW is 7 feet long and 10" wide with teeth to cut both ways. It has a stroke of 28" and is fitted to the arm between two heavy steel plates so arranged that it can be quickly connected or disconnected. By the use of a convenient hand lever the saw is moved up or down, to or from its work, while the machine is in motion, and it can be locked in position when elevated to the highest point to enable the operator to feed the log forward for the next cut.

THE DOG for holding the log consists of spurs located on each side of the saw, and it follows the saw when lifted from the cut without any attention on the part of the operator.

THE LOG FEEDING DEVICE is fitted on top with a steel track and upon this the log car travels. The track can be continued into the log yard and the car can also be used for hauling the logs to the machine; by this arrangement only one handling of the log is necessary. The ratchet lever used for moving the log is connected to a heavy steel shaft to which are fitted two taper spur wheels upon which the log rests, and they can be moved forward or backward by reversing the ratchet dog, for the purpose of gauging the length of cut.

THIS MACHINE is capable of cutting off a 24" hardwood log in one-half minute. It will do more work than twelve men with hand saws and do it better.

THE TIGHT AND LOOSE PULLEYS for driving the machine are 36" diameter, 6" face, and should run 140 turns per minute.

HORSE POWER to drive, 5; floor space occupied, 156" × 312".

No. 14 Improved Post Boring Machine.

Export Shipping Weight, 250 Pounds.

Net Weight, 165 Pounds.

Cubic Measurement, 7 Feet.

Cable Word, BLIURE.

No. 14 Improved Post Boring Machine.

Export Shipping Weight, 250 Pounds.

Net Weight, 165 Pounds.

Cubic Measurement, 7 Feet.

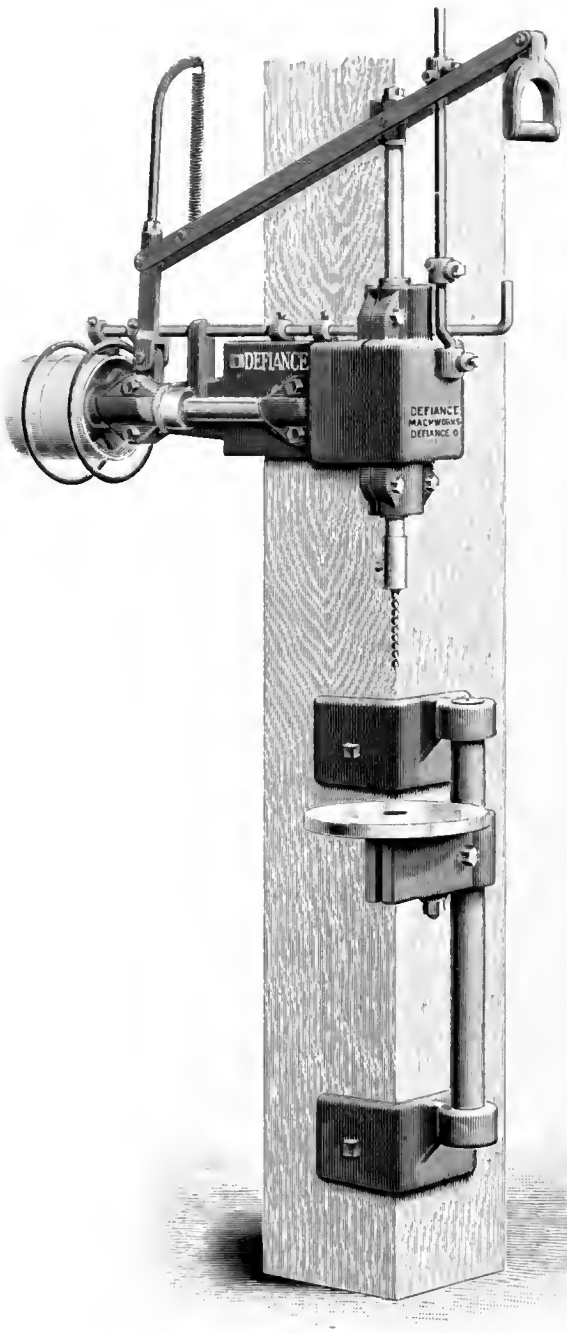
Cable Word, BLIURE.

THIS MACHINE is designed to attach to a post. It is a very handy and convenient tool used for a great variety of wood boring, and it will be found very useful in many shops where the expense of a larger one is not justified. It is self-contained and may be attached to a post in any part of the building where it can be belted to from the main line shaft.

THE BORING SPINDLE, of ground steel, is 1⅛″ diameter and slides in a splined sleeve, which rotates in self-lubricating bearings. The lower end is fitted with a ½″ straight hole to receive the boring bit. It is provided with a vertical movement of 8″, and it is brought down to its work by a convenient hand lever with a quick return movement by means of a spring. Suitable stops are provided for gauging the depth of the boring. It is driven by cut miter gears which are thoroughly encased. The horizontal spindle rotates in self-oiling boxes. The entire construction is such that it is capable of boring holes up to 2″ diameter in hard wood by 8″ deep

THE TIGHT AND LOOSE PULLEYS are 6″ diameter, 3″ face, with the loose pulley fitted with bronze bearings with a self-oiling device, and they should run 2,000 turns per minute. They can be belted to from above, below or either side. A convenient belt shipper is provided to be operated from the working side of the machine.

HORSE POWER to drive, ½; floor space occupied, 12″ × 36″.



No. 15 Improved Post Boring Machine.

Export Shipping Weight, 300 Pounds.

Net Weight, 215 Pounds.

Cubic Measurement, 8 Feet.

Cable Word, BOMPOKA.

No. 15 Improved Post Boring Machine.

Export Shipping Weight, 300 Pounds.

Net Weight, 215 Pounds.

Cubic Measurement, 8 Feet.

Cable Word, BOMPOKA.

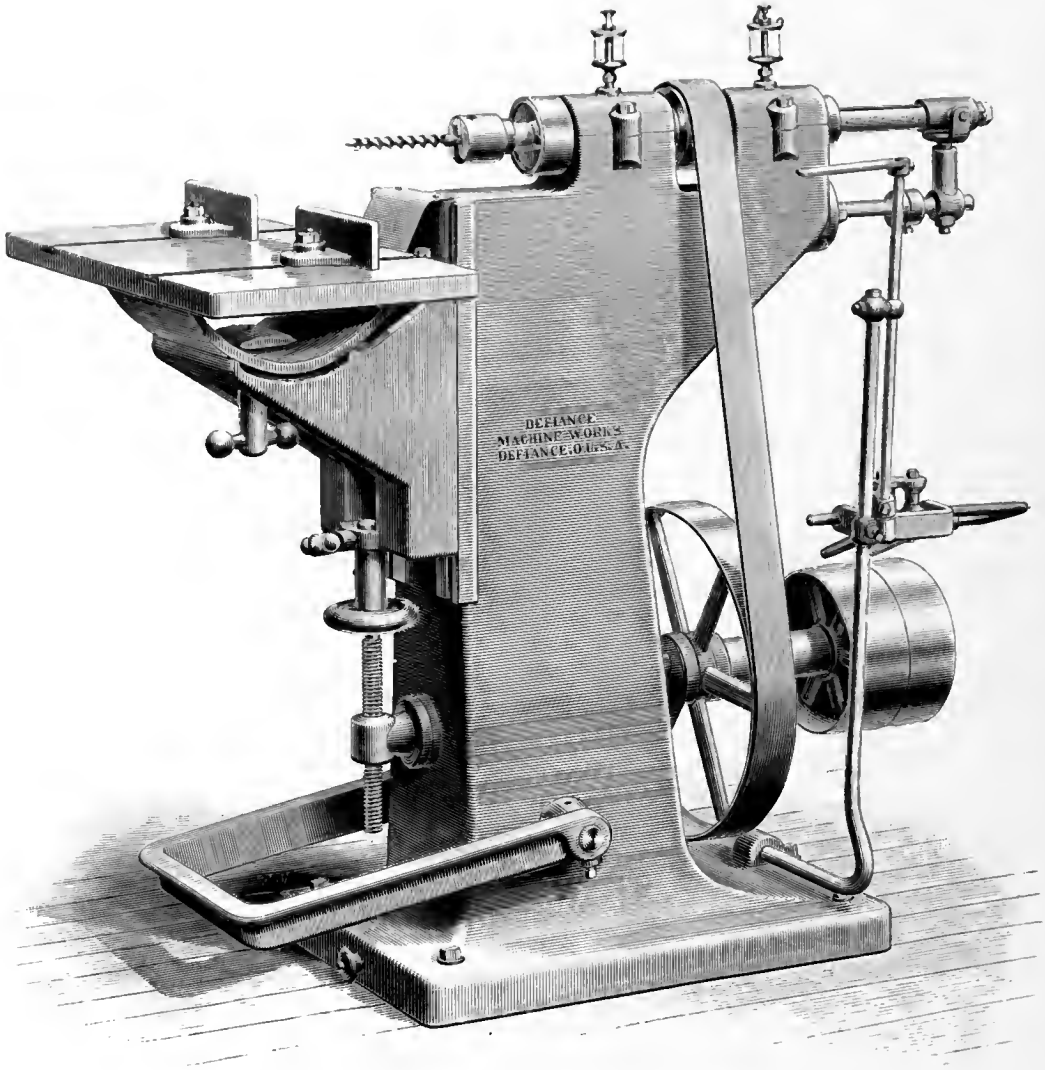
THIS ENGRAVING represents our No. 15 Improved Post Boring Machine, designed for the use of woodworkers in general. It is capable of boring a smooth hole in soft or hard wood up to 2″ diameter and 8″ deep and sizes under. It can be quickly attached to a post in any part of the workshop, where it can be reached by a belt from the main line shaft.

THE BORING SPINDLE, of ground steel, 1⅛″ diameter, slides into a splined sleeve, which rotates in long self-lubricating bearings. The lower end is provided with a ½″ straight hole to receive the boring bit. It is provided with a vertical movement of 8″, and it is brought down to its work by a convenient hand lever with a quick return movement by means of a coil spring. Suitable stops are provided to gauge the depth of boring. It is driven by cut miter gearing which is thoroughly encased. The horizontal spindle also rotates in self-lubricating bearings.

THE TABLE of iron is 10″ diameter, and it can be quickly adjusted vertically to suit the different thicknesses of material to be bored or swung out of the way when not required.

THE TIGHT AND LOOSE PULLEYS are 6″ diameter, 3″ face, with the loose pulley fitted with bronze bearings and a self-oiling device. They should run 2,000 turns per minute, and they can be belted to from above, below or either side.

HORSE POWER to drive, ½; floor space occupied, 12″ × 37″.



No. 1 Patent Horizontal Boring Machine.

Export Shipping Weight, 800 Pounds.

Net Weight, 500 Pounds.

Cubic Measurement, 32 Feet.

Cable Word, BAKER.

No. 1 Patent Horizontal Boring Machine.

Export Shipping Weight, 800 Pounds.
Net Weight, 500 Pounds.
Cubic Measurement, 32 Feet.
Cable Word, BAKER.

THIS MACHINE, of new design, embraces many desirable features, and is used for all kinds of straight or angular boring, as required in wagon, carriage, agricultural implement, furniture, chair, and car works.

THE FRAME is cast in one piece with cored center; it is very stiff and substantial, and of sufficient weight to stand firm without fastening to the floor.

THE TABLE, of iron, 24″ × 12″, is gibbed to the frame, and by means of a single screw is adjusted vertically for different thicknesses of material; it can be tilted to a 45 degrees angle in either direction to bore at any angle up or down. All the adjustments are most complete, and large wearing surfaces secured throughout.

THE FENCE is made in two parts; each is adjustable over the entire face of the table, for different widths and for boring at any angle. They can be locked in any position by a screw fitted into T shaped slots planed full width of table.

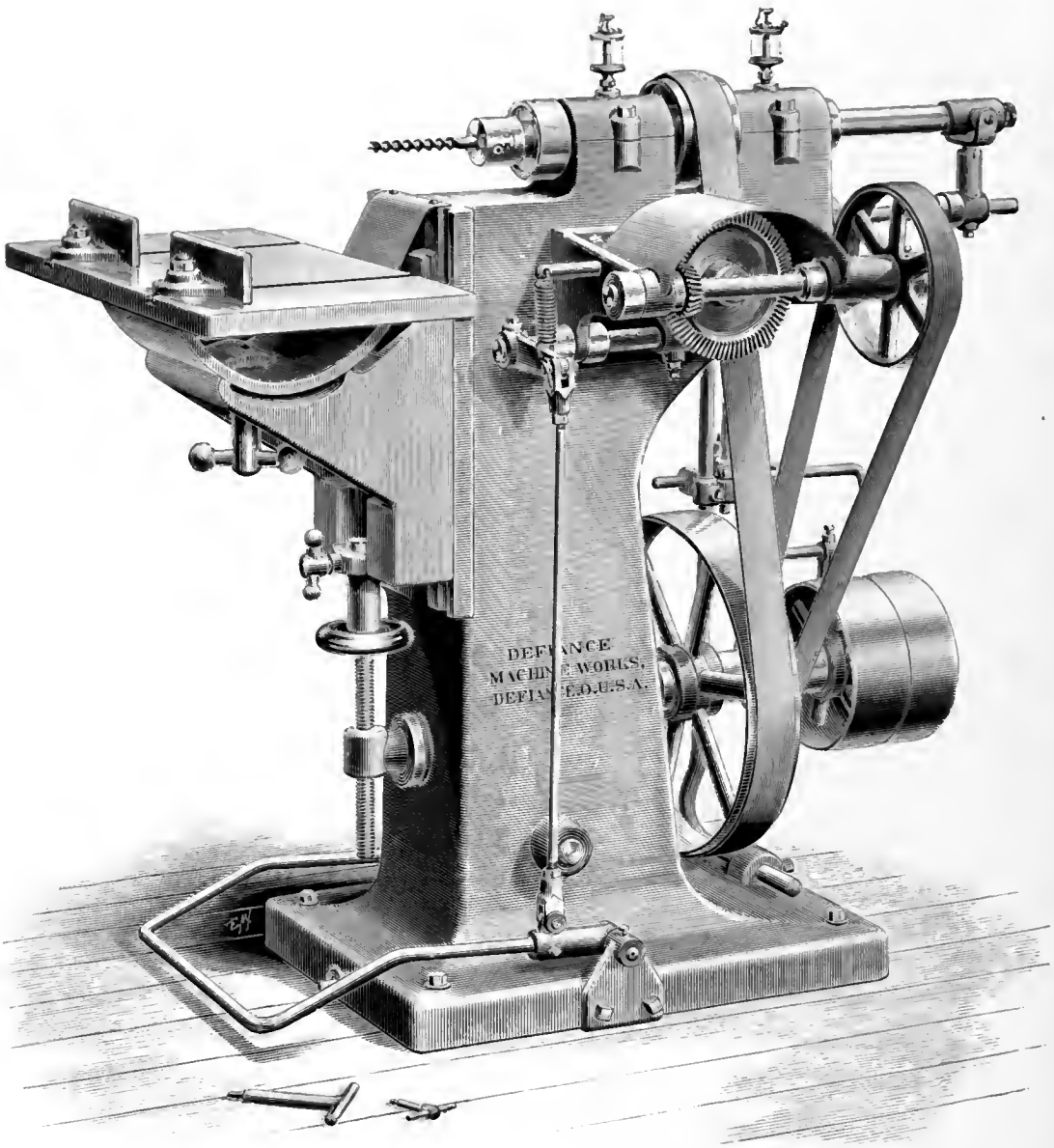
THE BORING SPINDLE, of hammered steel, $1\frac{5}{16}$″ diameter, is fitted into a sleeve 15″ long, $1\frac{1}{16}$″ diameter; they are connected together by a steel feather on either side, which slides in grooves in the spindle. The outside diameter of the sleeve is fitted into genuine babbitt metal bearings in the frame. By this arrangement, the sliding and rotating movements of the spindle are not confined to a single bearing, and the wear to the spindle is greatly reduced. Thus the spindle slides with the greatest ease and accuracy. An adjustable collar on the sliding shaft underneath the spindle is used for graduating the depth of hole to be bored. The spindle is traversed by a convenient treadle, which can be reached from the front or either side of the machine, and is provided with spring balance, giving a quick return to the spindle.

AN INGENIOUS PNEUMATIC CUSHION attached to the boring end of the spindle, immediately behind the chuck, entirely avoids shock or jar to the spindle when it retreats, which greatly adds to the life of the machine, and makes it much more pleasant to operate.

THIS MACHINE will bore holes in hard wood up to 2″ diameter, 7″ deep. It is supplied with four boring augers, wrenches, and a universal chuck that will open to receive from the smallest to ½″ diameter shank.

THE COUNTER is a portion of the machine, and can be belted to from above, below, or either side. Tight and loose pulleys, 8″ × 3″; speed, 1,000 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, 24″ × 48″.



No. 2 Patent Automatic Horizontal Boring Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 32 Feet.

Cable Word, BOSFORUS.

No. 2 Patent Automatic Horizontal Boring Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 700 Pounds.
Cubic Measurement, 32 Feet.
Cable Word, BOSFORUS.

THIS ENGRAVING represents our No. 2 Automatic Power Feed Horizontal Boring Machine, which is used by wood-workers generally for boring holes from the smallest size to 2½" diameter, 7" deep and shorter in hard or soft wood.

THE FRAME, of iron, is cast in one piece with cored center and it is very stiff and substantial. It is of sufficient weight to stand firm without fastening to the floor.

THE TABLE, of iron, is 24" × 12". It is planed true and fitted with T slots for the adjustment of the gauges. The saddle supporting the table is gibbed to the front of the main frame, and it is adjustable vertically by hand-wheel to suit different thicknesses of work. The table is adjustable to a 45 degrees angle, in either direction, to bore at any angle up or down.

THE FENCE is made in two parts. Each is adjustable over the entire face of the table for different widths of work, and for angular boring. They can be locked in any position by a screw fitted into the T slots.

THE BORING SPINDLE is fitted with a universal chuck for holding the bit, and it will open from 0 to ½". The spindle is of steel, of large diameter, and it is fitted through a long sleeve extending from out to out of the boxes. The outside diameter of the sleeve rotates in genuine babbitt metal bearings on the frame of the machine, and the spindle slides through the sleeve. By this device the rotating and sliding movements of the spindle have separate bearings, which reduces the wear and secures an accurate and true running machine.

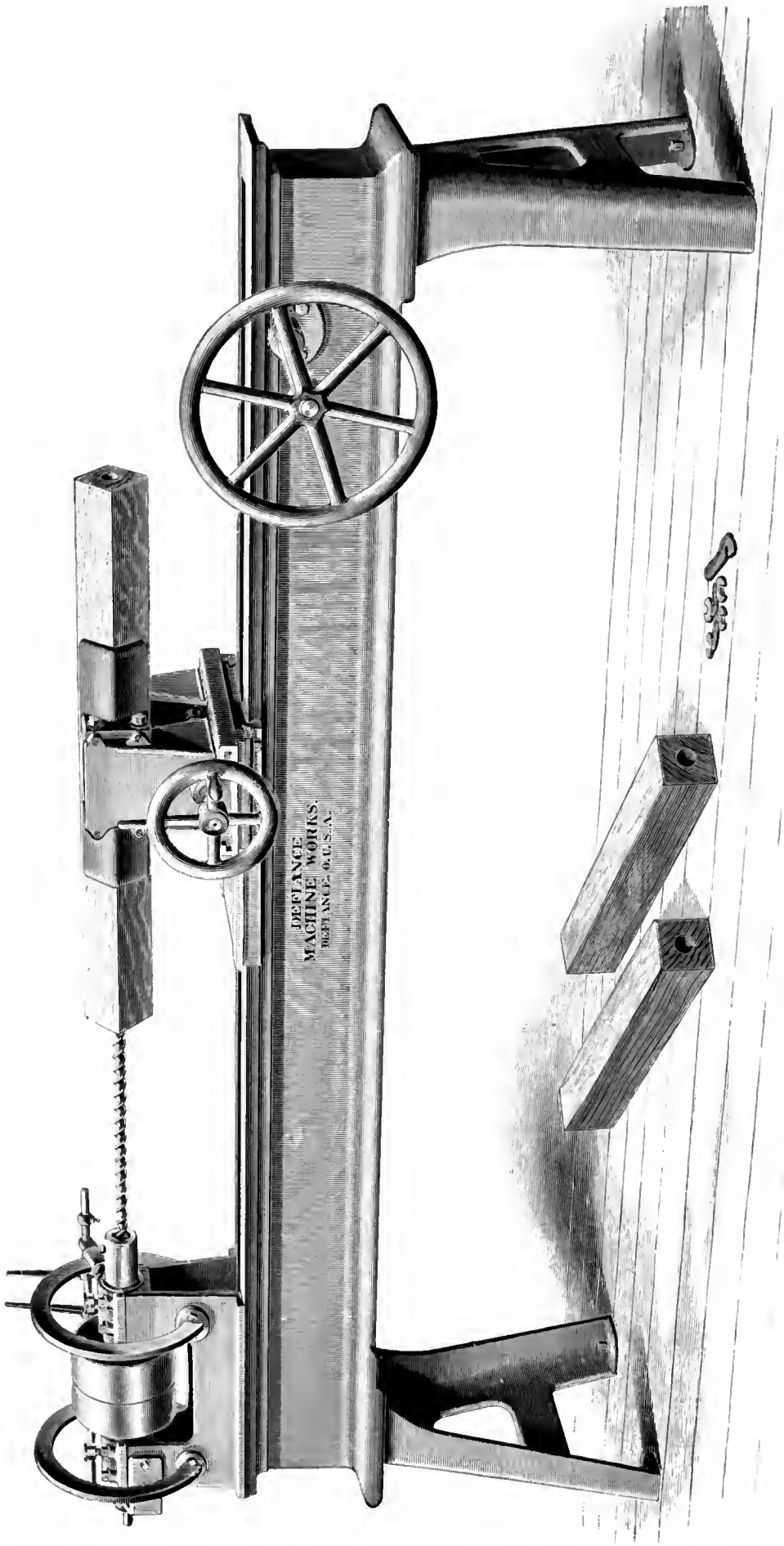
THE AUTOMATIC POWER-FEED, to the boring spindle, is so constructed that the slightest touch of the operator's foot upon the pedal at the base of the machine instantly brings the boring bit forward to its work, and it can be stopped at any position. The feed being regular and steady, a smooth and true hole can be bored and without any effort on the part of the operator. After boring, the spindle instantly returns ready for the next operation.

A PNEUMATIC CUSHION receives the spindle when it returns from its work, which entirely overcomes shock or jar, making a soft cushion, entirely free from noise or injury to the machine.

ITS CAPACITY is very much larger than that of a foot or hand power machine. Both hands of the operator are free to handle the work and the operator's foot never leaves the floor in bringing the spindle forward as the pedal is close to the floor and its movement is very slight.

THE COUNTER is part of the machine; the tight and loose pulleys are 8" × 3"; speed, 1,000 rotations per minute. It can be belted from above or below.

HORSE POWER to drive, 1; floor space occupied, 24" × 48".



No. 4 Improved Horizontal Boring Machine.

Export Shipping Weight, 1,800 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 112 Feet.
Cable Word, BOREGO.

No. 4 Improved Horizontal Boring Machine.

Export Shipping Weight, 1,800 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 112 Feet.

Cable Word, BOREGO.

THIS ENGRAVING represents our No. 4 Improved Horizontal Boring Machine, designed to bore holes in either hard or soft wood, up to 42″ deep and shorter, and from the smallest sizes up to 3″ diameter. It is capable of producing a true, straight hole. The boring tools used are of special design, and they are furnished to suit the nature of the work expected of them. Fluted bits are employed for holes up to 1¼″, and for larger sizes the Wyckoff tools are used.

THE FRAME of this machine is a heavy, deep casting with cored center, and it is accurately planed and scraped on top to make a perfect bearing for the working parts.

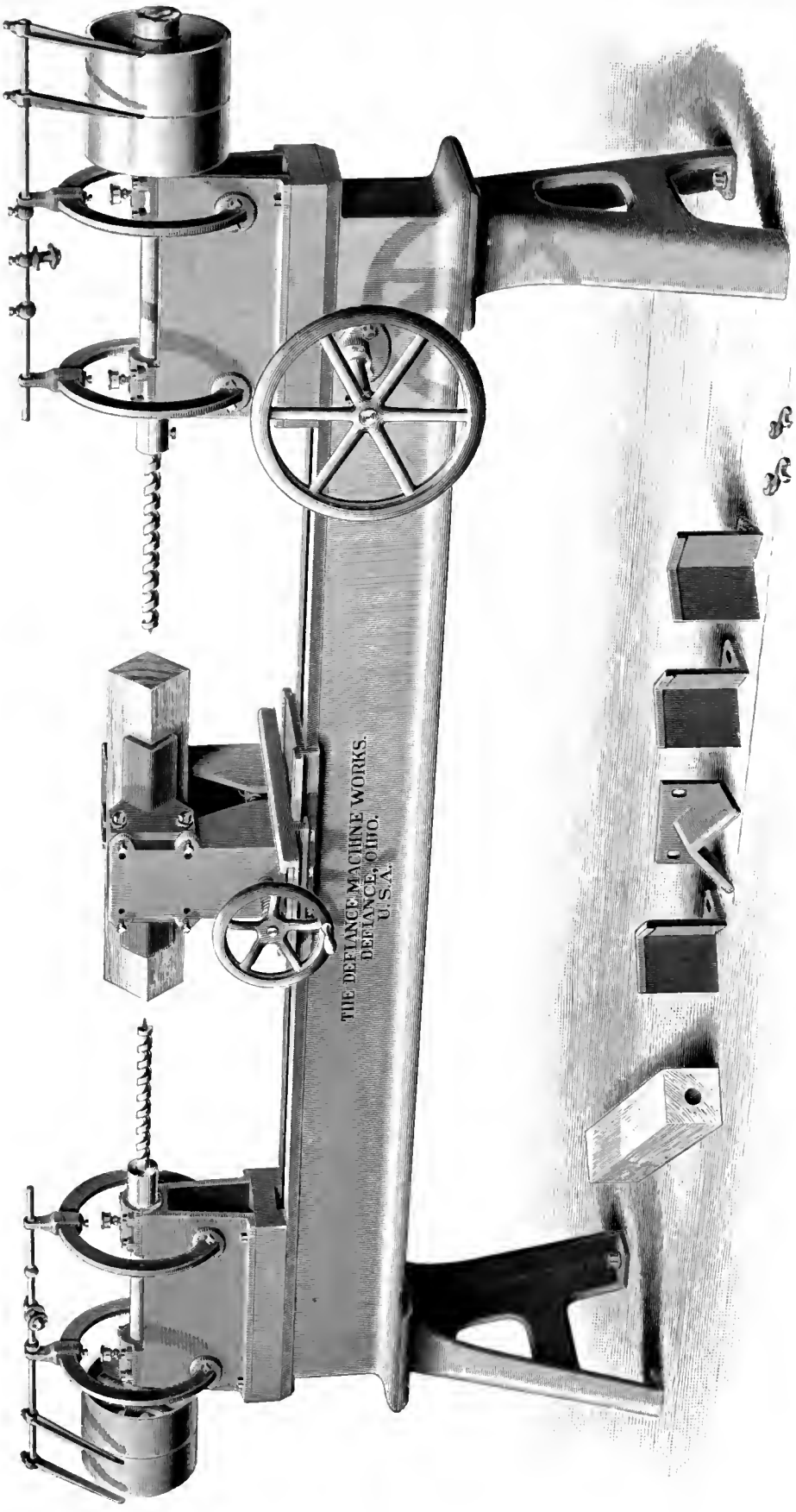
THE HEADSTOCK is fitted with a hollow steel spindle arranged to feed the chips through it when using the Wyckoff boring tools. It is also arranged with chucks for holding the small tools. It runs in heavy self-lubricating bearings with the tight and loose pulleys between them. A convenient, adjustable, belt-shifting apparatus is furnished for starting and stopping the machine.

THE CARRIAGE is accurately fitted and gibbed to the top of the bed, with self-centering jaws mounted upon it. The faces of the jaws are planed true to an angle of ninety degrees to center a square block perfectly with the boring tool. They are opened and closed by a right and left hand screw operated by a convenient hand-wheel. A horizontal movement of eight feet is secured by turning the large hand-wheel to feed the work to and from the boring tool.

THIS MACHINE is thoroughly reliable in every detail, and with it a large amount of work can be produced. In ordering, give the size of holes to be bored and the greatest depth to each size.

THE TIGHT AND LOOSE PULLEYS are 8″ × 3″, and should run 800 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, 27″ × 108″.



No. 5 Improved Double Ended Boring Machine.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,500 Pounds.
Cubic Measurement, 118 Feet.
Cable Word, BALFOUR.

No. 5 Improved Double Ended Boring Machine.

Export Shipping Weight, 2,000 Pounds.

Net Weight, 1,500 Pounds.

Cubic Measurement, 118 Feet.

Cable Word, BALFOUR.

THIS ENGRAVING represents our No. 5 Improved Double Ended Boring Machine, designed for boring each end of square wood blocks from which rollers are turned, in the ends of which iron journals are used. After the journals are inserted, the wooden squares are turned round by the journals, thus making the roller run true with its journals. Other classes of square or round stock can be bored with equal facility.

THIS MACHINE measures 64″ between the front ends of the boring spindles. It will, therefore, bore clear through material 30″ long and anything shorter. Longer work may be accommodated if the boring is only required part way through the block, depending upon the length of the boring bits used, or, for extra long work, one of the boring stocks can be removed from the machine, and one hole bored at a time, by reversing the material in the chuck.

THE FRAME of this machine is cast in one piece, with cored center, making it very stiff and reliable. The top is planed true and scraped to an accurate bearing, so that the carriage travels over it with the greatest ease.

THE BORING SPINDLES stand directly opposite and in perfect alignment with each other, and they rotate in heavy self-lubricating bearings, with the driving pulleys at the rear end, and they are provided with a convenient belt shipper for moving the belts for starting or stopping the machine.

THE CHUCK for holding the work is self-centering. The jaws are propelled by a quick-acting right and left hand screw, provided with a convenient hand-wheel. The jaws will open to take square stock 8″ × 8″, or anything smaller. The carriage supporting the jaws is gibbed to the top of the main frame and it moves in a horizontal plane, by turning the large hand-wheel to bring the work up to either the right or left hand boring bit. No skill is required to operate this machine and it will produce a large amount of perfect work.

THE TIGHT AND LOOSE PULLEYS are 10″ diameter, 4″ face, and they should run 1,500 turns per minute. They can be belted to from above, below, or either side, direct from the main line shaft.

HORSE POWER to drive, 2½; floor space occupied, 28″ × 120″.

No. 6 Vertical Spindle Boring Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,000 Pounds.
Cubic Measurement, 99 Feet.
Cable Word, BARNAGEE.

No. 6 Vertical Spindle Boring Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 99 Feet.

Cable Word, BARNAGEE.

THIS ENGRAVING represents our No. 6 Vertical Spindle Boring Machine, designed for use in chair, furniture, agricultural implement, wagon, carriage, automobile and pattern shops and woodworkers in general, for straight or angular boring in hard or soft wood.

THE FRAME is designed on graceful lines, heavy and strong, cast in one piece with cored center and a broad floor base to stand firm.

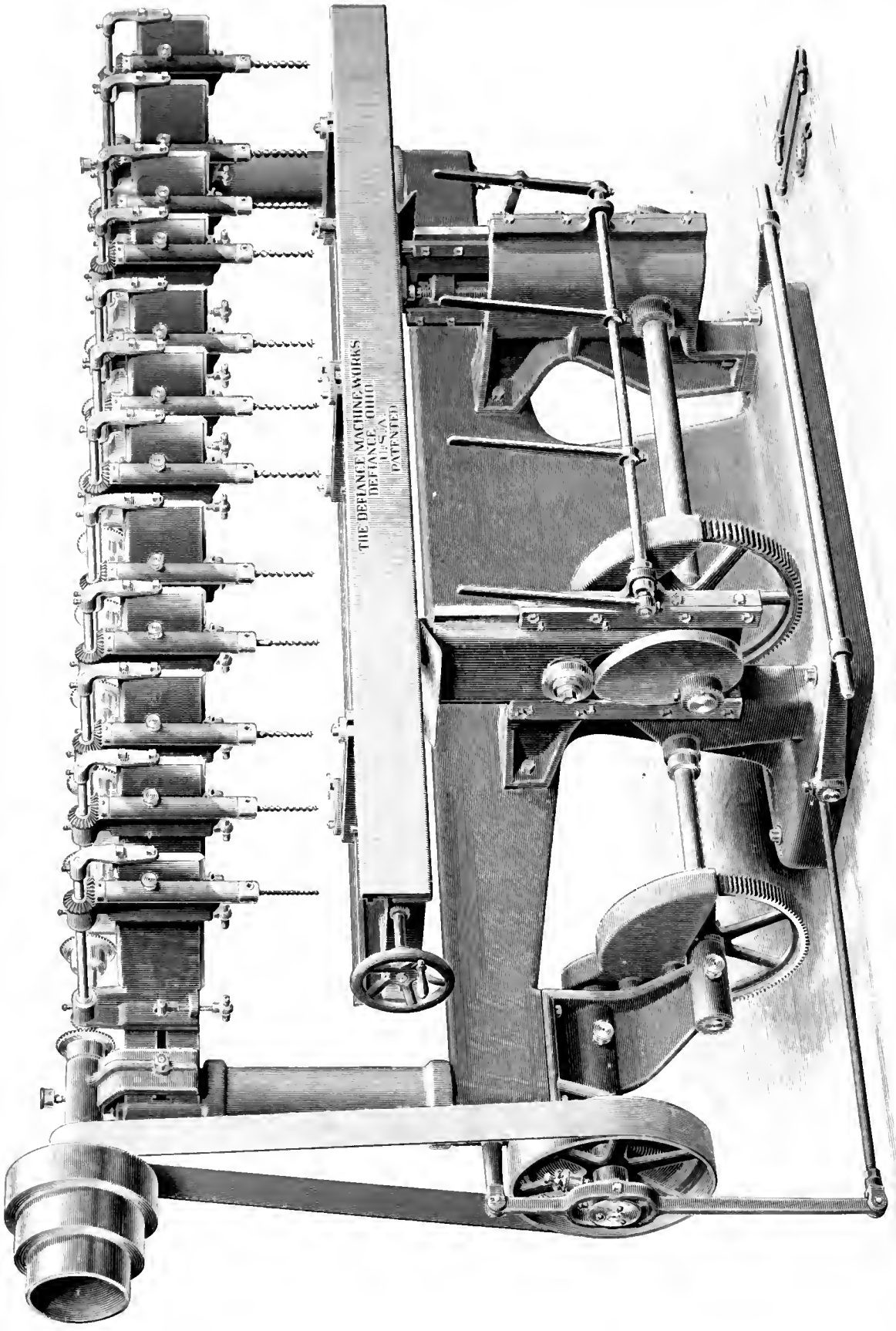
THE BORING SPINDLE of ground steel, $1\frac{5}{16}$" diameter, slides into a splined sleeve, which rotates in bronze journal bearings which are self-lubricating. The lower end is fitted with a ½" straight hole to receive the boring bit. It is provided with a vertical movement of 12" and brought down to its work with a convenient foot treadle, with a quick return movement by means of a weighted counterbalance. Suitable stops are provided for gauging the depth of boring.

THE TABLE is 18" × 27" in size, is gibbed to the frame and can be raised or lowered by means of a convenient hand wheel. It is provided with a guide adjustable clear across the face of the table, and it can be clamped in any position. The table has a lateral and longitudinal adjustment within a limit of 30 degrees for angle boring. Five boring bits are furnished, $\frac{3}{8}$", ½", $\frac{5}{8}$", $\frac{3}{4}$" and 1".

THE IDLER PULLEYS are adjustable to properly track the belt and they are fitted with bronze bearings and are self-lubricating.

THE COUNTER is a part of the machine and it can be belted to from any direction. The tight and loose pulleys are 10" diameter × 5" face, with the loose pulley fitted with bronze bearings, and they should run 800 turns per minute, giving a bit speed of 3,300 turns.

HORSE POWER to drive, ½; floor space occupied, 31" × 6[illegible]".



No. 10 Patent Automatic Gang Boring Machine.

Export Shipping Weight, 5,400 Pounds.
Net Weight, 4,500 Pounds.
Cubic Measurement, 240 Feet.

No. 10 Patent Automatic Gang Boring Machine.

Export Shipping Weight, 5,400 Pounds.
Net Weight, 4,500 Pounds.
Cubic Measurement, 240 Feet.
Cable Word, BRONX.

THIS ENGRAVING represents our No. 10 Patent Automatic Gang Boring Machine, calculated for boring twelve or a lesser number of holes at one time in either hard or soft wood, within a limit of 8 feet from center to center of the end spindles. All the spindles can be quickly adjusted to bore holes as close as 2½″ from center to center, and have otherwise an infinite adjustability on a line parallel with the machine, and a transverse right angular adjustment of 12″. Other boring spindles than those represented by the engraving are furnished to order, including the spindles in cluster, some of which may be as close together as 1⅛″ from center to center, and the machine can be furnished on special order with any number of spindles required, and to take 8, 10, or 12 feet from center to center of outside spindles.

THIS MACHINE is calculated to answer the demand for a gang boring machine of better workmanship, stronger construction, and more completely automatic in its action than has heretofore been offered.

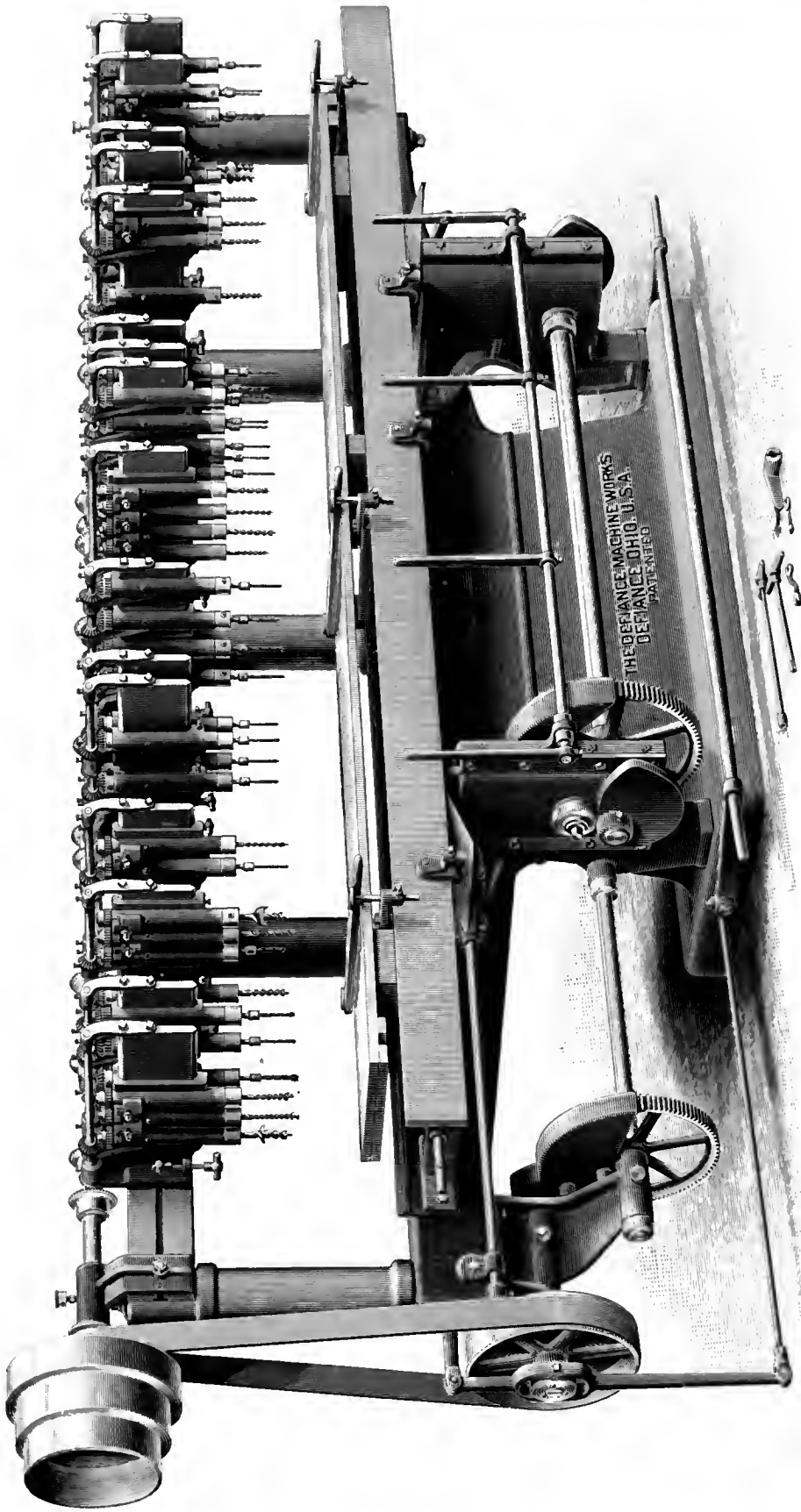
THE FRAME of this machine is cast in one piece, with cored center and wide floor base. It is very strong and durable in all its parts to overcome all tendency to spring. It is entirely self-contained, and it can be easily adjusted to the different kinds of work.

THE TABLE is susceptible of adjustment to any desired height independently of the means by which it is automatically raised, by the aid of a convenient hand-wheel to accommodate the various thicknesses of stock and the depth of boring. Means are provided for raising and lowering the table continuously, and also for arresting the movement of the table automatically at each downward stroke, together with means for arresting the movement of the table by hand, at any part of the stroke. The action of the table is controlled by the pressure of the operator's foot upon the long treadle in front at the base of the machine, the operator having complete control over the machine from the working side.

THE BORING SPINDLES, of steel, rotate in long bronze self-lubricating bearings, and the gears for driving them are made of bronze, and steel, and all the teeth are cut by the most modern practice, which enables them to run at a high speed, smooth and free from noise; each spindle has a 12″ right angular adjustment and a horizontal adjustment from 2½″ up to 8 feet from center to center, thus making it a most desirable machine for the use of wagon, agricultural implement, furniture, car, and ship builders.

THE COUNTER is furnished as follows: Shaft, 1 1/16″ × 48″; two No. 1 ball and socket adjustable drop hangers, with new style belt shipping apparatus; one three-step cone driving pulley; one pair of tight and loose pulleys, 12″ × 4″, with loose pulley fitted with bronze bearings; speed, 700 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, 40″ × 131″.



No. 12 Patent Automatic Wagon-Box Boring Machine.

Export Shipping Weight, 6,900 Pounds.
Net Weight, 5,700 Pounds.
Cubic Measurement, 325 Feet.
Cable Word, BUENO.

No. 12 Patent Automatic Wagon-Box Boring Machine.

Export Shipping Weight, 6,900 Pounds.
Net Weight, 5,700 Pounds.
Cubic Measurement, 325 Feet.
Cable Word, BUENO.

THIS ENGRAVING represents our No. 12 Patent Automatic Wagon-Box Boring Machine, which has been designed especially for the use of wagon manufacturers for boring and counter-boring all the holes in wagon-box sides at one time by a single upward movement of the table, and the work is accomplished perfectly, making all the holes register alike, so that the boxes can be quickly and correctly assembled without loss of time. Previous to the invention of this machine this work was accomplished entirely by hand labor. Each of the 45 or more holes were bored separately, with no degree of accuracy, and at large cost, it being of necessity a slow and tedious process. All this is now accomplished by this new machine with unskilled labor much more accurately and at an immense saving. It is one of the greatest labor saving wood-working machines that has ever been placed upon the market.

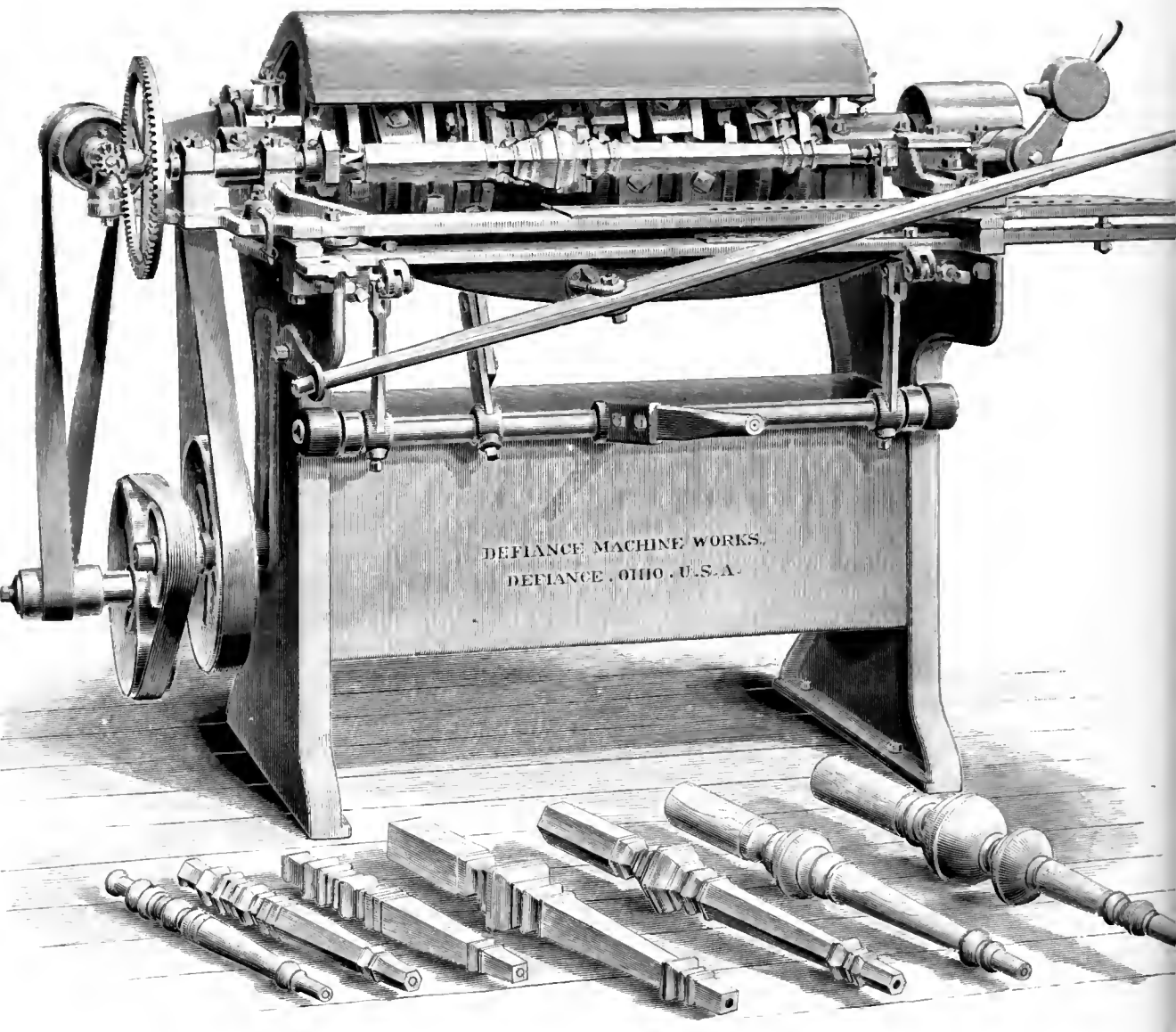
THE FRAME is a massive casting in one piece, with cored center and a broad floor base, making it very strong and durable in all its parts to overcome all tendency to sprain. It is entirely self-contained and easily adjusted.

THE TABLE is adjustable vertically to any desired height independently of the means by which it is automatically raised to accommodate various thicknesses of stock and depth of boring. Means are provided for raising and lowering the table continuously, and also for arresting its movement automatically at each downward stroke, together with means for arresting the movement of the table by hand at any part of the stroke. The action of the table is controlled by the pressure of the operator's foot upon the long treadle in the front at the base of the machine.

THE BORING SPINDLES rotate in bronze bearings which are self-lubricating. The gears of bronze and steel are cut from the solid, enabling them to run at a high speed, smooth and free from noise. Each spindle has a 12″ right angular adjustment and a horizontal adjustment of 12 feet from center to center of the outside spindles, and otherwise an infinite adjustability for almost any class of boring. Other boring spindles than those represented by the engraving are furnished to order to suit any special work.

THE COUNTER is furnished as follows: Shaft, $1^{11}/_{16}$″ × 48″; two No. 1 Ball and Socket Adjustable Drop Hangers; with new style belt shipping apparatus; one three step cone pulley; one pair of tight and loose pulleys 12″ × 4″, with loose pulley fitted with bronze bearings; speed, 700 turns per minute.

HORSE POWER to drive, 3; floor space occupied, 40″ × 180″.



32″ Patent Variety Lathe.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,200 Pounds.

Cubic Measurement, 81 Feet.

Cable Word, 24″ Machine, LEND.

Cable Word, 32″ Machine, LOUD.

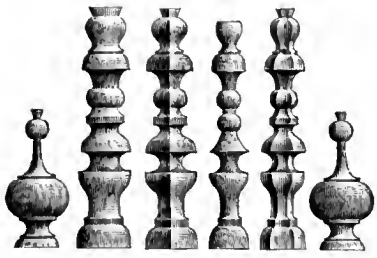
Cable Word, 38″ Machine, LAWRENCE.

Cable Word, 42″ Machine, LEATHER.

Cable Word, 48″ Machine, LUTHER.

Cable Word, 52″ Machine, LEAD.

Cable Word, 58″ Machine, LAND.



32″ Patent Variety Lathe.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,200 Pounds.

Cubic Measurement, 81 Feet.

THIS ENGRAVING represents our Patent Variety Lathe especially designed for turning table legs, stair balusters, ball bats, croquet mallets, piano stool posts, Indian clubs, tenpins, and various other shapes of fancy turning, or plain work where exact duplicates and accuracy are required.

THE FRAME is a trunk casting, cored out, making it exceedingly stiff and strong without unnecessary weight. The machine is built in seven different sizes to turn material up to the following lengths: 24″, 32″, 38″, 42″, 48″, 52″, and 58″. These are extreme lengths which the different machines will turn. They, however, will turn anything shorter than the lengths given.

THE SPINDLE is made of forged steel running in genuine babbitt metal bearings made in halves and provided with self-lubricating oil cellars and cups.

THE CUTTER HEADS each carry three knives with their cutting edges shaped to suit the style of work desired to turn. It requires different heads and knives for different styles of work, but with any one set of heads and knives the machine can be adjusted by the use of inexpensive cams for turning the same shape of work in round, oval, hexagon, octagon, and square without any change whatever in the cutters; a moment's time is required to change the machine from any one of the shapes specified.

THE TABLE is operated by a convenient hand lever, and it slides upon planed V-shaped ways and is gibbed to the frame. The table is provided with adjusting screws at each end for regulating the diameter of turning. This can be instantly accomplished and the diameter of turning may be varied from the smallest size up to 8″ diameter; it can be furnished to swing up to 12″ diameter when so ordered. The headstock contains a spur center which is rotated by a belt from the cutter head spindle to a sub-counter, attached to the base of the machine, thence to tight and loose pulleys, which are movable, with the table so arranged that the belt for driving the feed is automatically shifted as the table is moved in and out, rotating the material to be turned as it advances toward the cylinder and stopping it automatically when the table is moved back to the proper position to remove the turned object from the centers after the turning is performed.

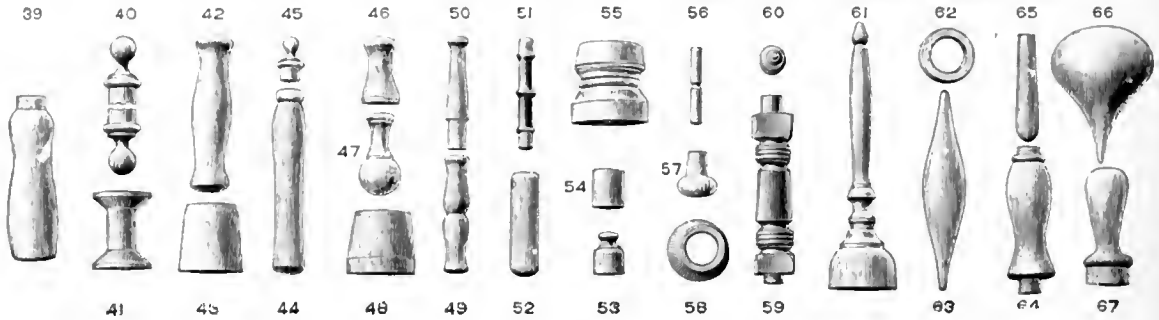
THE OPERATION of this machine is quick and simple. The material to be turned is placed between the centers in its rough state, with square corners if desired, and moved to the cutter heads by the hand lever, when it is reduced to its proper diameter and shape its entire length at one and the same time. With the knives kept in proper order the work is turned smooth so that no polishing is required. Sharp corners, small curves, and fine beads can be cut without breaking them down or lifting the fiber.

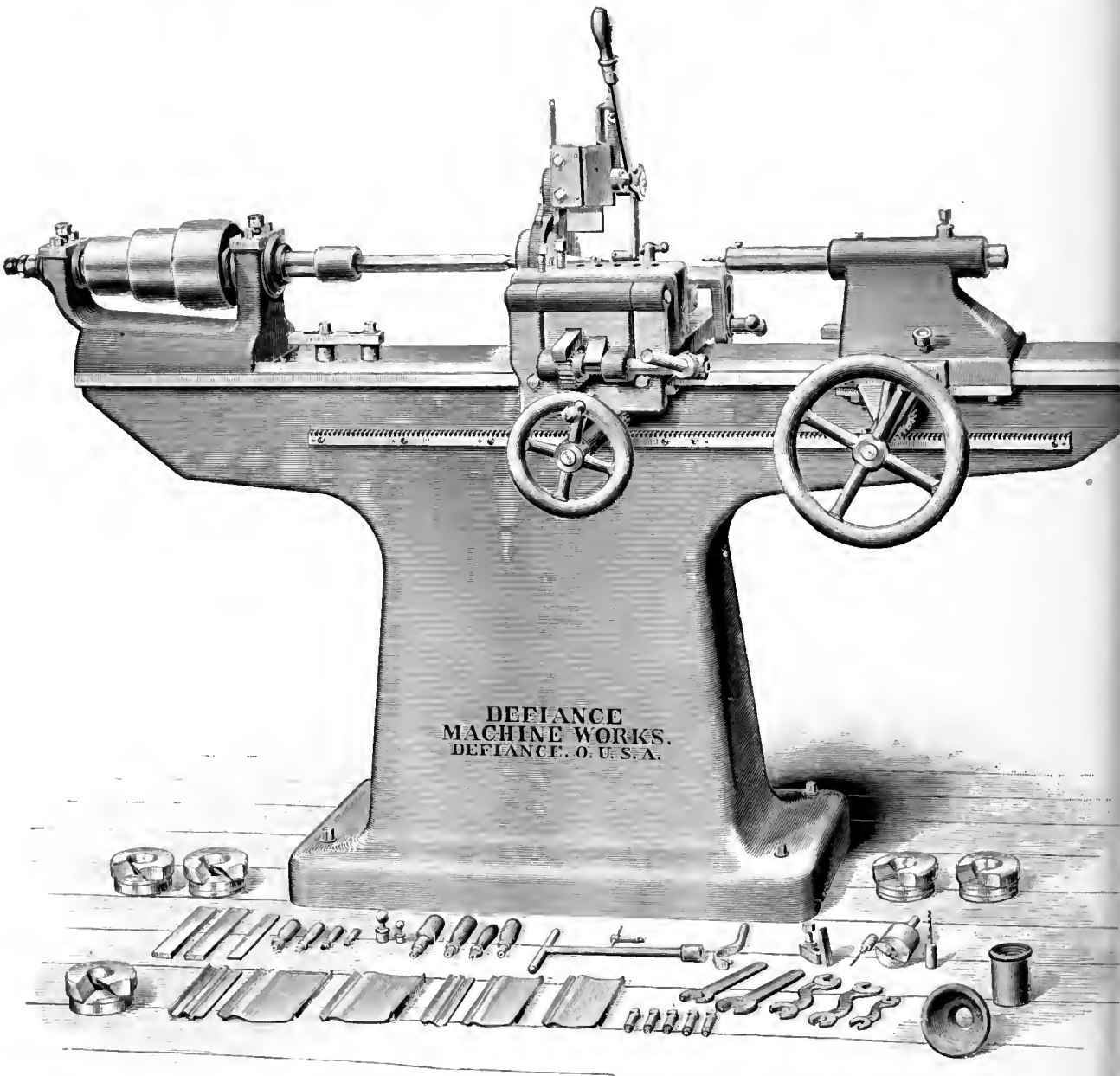
THE CAPACITY of this machine depends somewhat upon the style of work, varying from 1,000 to 3,000 pieces per day. Round, oval, oblong, square, hexagon, or octagon shapes can be turned with equal success. Samples of the work as shown represent some of the different shapes that can be successfully produced with this machine. Before prices can be quoted for these machines it will be necessary for us to have a full size drawing of the different shapes to be turned.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ diameter; two No. 2 adjustable drop hangers; driving pulley, 30″ × 6″; tight and loose pulleys, 14″ × 6″; speed, 600 rotations per minute; pulley on machine, 8″ diameter, 6″ face.

SAMPLES of work submitted upon application.

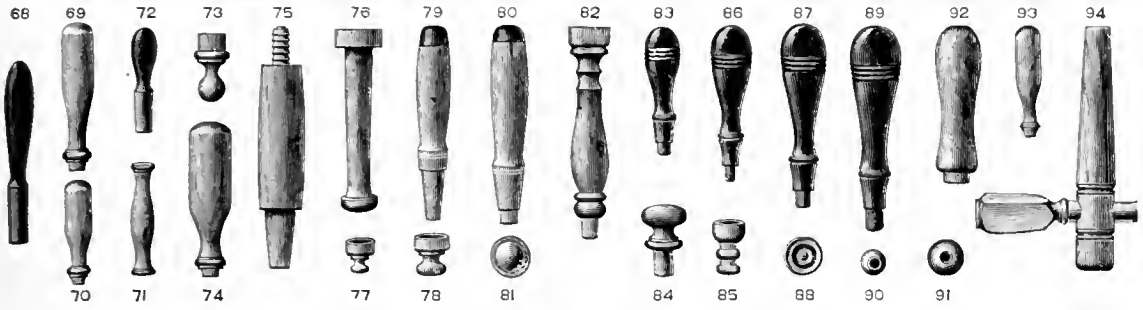
HORSE POWER to drive, 4; floor space occupied for 24″ machine, 37″ × 66″; for other sizes add difference only to length of each sized machine.





No. 0 Patent Variety Turning and Boring Lathe.

Export Shipping Weight, 2,200 Pounds.
Net Weight, 1,700 Pounds.
Cubic Measurement, 73 Feet.
Cable Word, LENOWEE.



THIS ENGRAVING represents our No. 0 Variety Turning and Boring Lathe, which has been designed with the greatest care to embody in it all the essential features to make it a high class machine for rapidly and accurately producing turned articles from wood. It is arranged to meet the most exacting requirements. Never before has there been a machine invented for producing light fancy turning and boring that would fully meet the demands of manufacturers who wish to produce turned work, sharp, clean, and smooth, in either plain or beaded turning, and do the work so that no hand labor is required after leaving the machine.

THIS MACHINE is calculated to cover a wide range of work. A few samples as produced with it are shown by the accompanying engravings, although it is by no means limited to these samples. The material from which the work is turned is placed into the machine in short or long pieces, not to exceed 36″ at the longest, and it is converted into the finished article, bored, turned, polished, and cut off complete ready for use. The design of turning is governed by the shape of the finishing knife used. It requires a special shaped knife for each article of different design to be turned. The shape of turned work desired to be made is milled the full length of the knife, so that the exact duplicate of work is always secured, and in sharpening the knife it is only necessary to dress the cutting edge, thus reducing it to the simplest possible form so that it can be handled successfully by inexpensive labor.

THE FRAME of this machine, of neat design, is cast in one piece with cored center and a broad floor base to stand firm. The top is accurately planed and scraped to bearing for the working parts.

THE HEAD SPINDLE, of steel, runs in large bronze, self-lubricating bearings, and it is driven by a three-step cone pulley, giving three changes of speed for small or large work. The front end of the spindle is fitted with a screw chuck to hold one end of the material to be turned, the other end turning in the roughing head bush.

THE CUTTER HEAD CARRIAGE is thoroughly gibbed to the top of the frame of the machine, and it is provided with a horizontal movement by hand-wheel to move the cutters to where the turning shall begin. It also has a right angular movement by hand lever, to move the finishing knife to the work.

THE ROUGHING CUTTER is attached to the carriage immediately in advance of the finishing knife. It reduces the square material to the smallest diameter to which it will nicely finish. The cut-off attachment is also fitted to the carriage and travels with it. It stands in a vertical plane and is brought down to its work by a convenient hand lever.

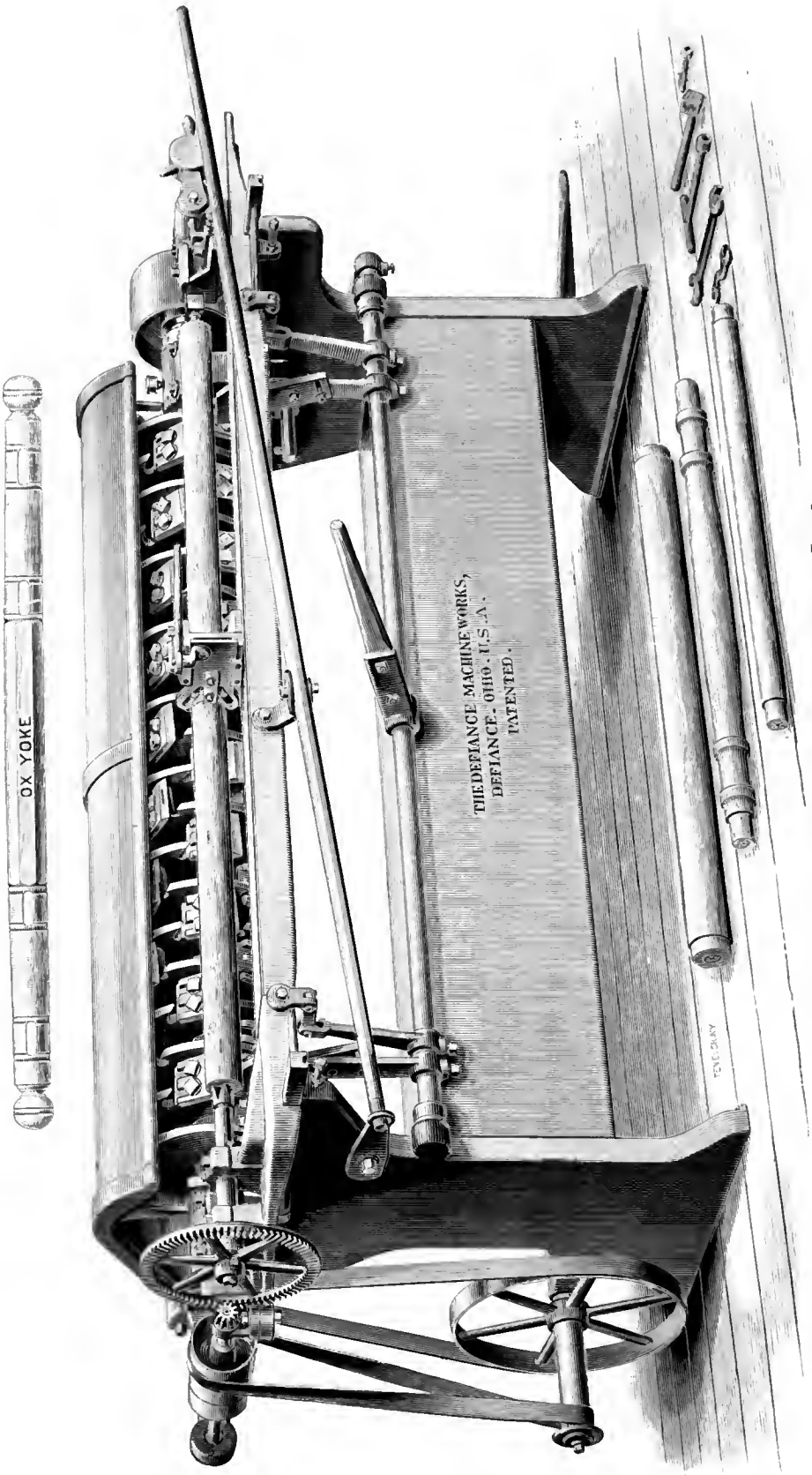
THE TAIL STOCK is gibbed and accurately fitted to the top of the frame, central with the head spindle. It is fitted with a large spindle to carry a boring bit to bore holes of different sizes. When work is intended to be bored, the boring is performed before the turning is accomplished, leaving the boring bit in the hole while turning, it acting as a steady rest. For doing work that requires no boring, a cup center is used in place of the bit. The tail spindle is brought up to or from its work by a convenient hand-wheel.

IN OPERATING this machine, the square material to be turned is placed into the chuck while the machine is in motion. No stoppage is necessary either to place in the rough material, or to take out the finished product. The material is first roughed by sliding the carriage forward in a horizontal plane a sufficient distance to suit the length of the article to be turned. The boring is then performed, after which the finishing knife is brought up to the work, which is shaped complete at one movement. The cut-off knife is then brought down by hand lever and the finished product is discharged from the machine, and so the work is continued until the material in the lathe is entirely consumed.

THE CAPACITY of this machine is sufficient to produce from 5,000 to 8,000 pieces per day, depending upon the size and shape of work and the quickness of the operator. It will turn irregular work eight inches long and shorter, but plain round work, such as rollers, pins, etc., can be turned up to 36″ long, and from $\frac{1}{8}$″ to 3″ diameter.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$″ × 42″; two No. 2 ball and socket adjustable drop hangers; one improved belt shipping apparatus; one step cone pulley, 14″, 15″, and 16″ diameter, for 3″ belt; the tight and loose pulleys are 10″ × 4″; speed, 650 turns per minute.

HORSE POWER to drive, 2; floor space occupied, 28″ × 78″.



72″ Patent Automatic Turning Lathe.

Export Shipping Weight, 4,000 Pounds.
Net Weight, 3,000 Pounds.
Cubic Measurement, 133 Feet.
Cable Word, LEWIS.

72″ Patent Automatic Turning Lathe.

Export Shipping Weight, 4,000 Pounds.

Net Weight, 3,000 Pounds.

Cubic Measurement, 133 Feet.

Cable Word, LEWIS.

THIS ENGRAVING represents our Patent 72″ Automatic Turning Lathe, designed for turning wooden rollers for harvesting machines, reel shafts, hand levers, neck-yokes, single-trees, wheelbarrow handles, cant hook levers, ox yokes, and various other classes of turning.

IT IS the only machine that will finish this class of work so perfectly that no sanding is required after turning.

IT WILL turn material up to 72″ long and shorter, from 8″ diameter and smaller, turning the entire length of the material at one time; square timber is placed into this machine, which quickly turns off the corners and finishes the work round and smooth. Rollers can be turned with the iron spindles driven into the ends or without them, as desired, producing 1,500 or 1,600 heavy rolls, or 2,000 neck-yokes or single-trees, in ten hours.

THE FRAME is a massive casting with a cored center, of sufficient weight and strength to withstand the heavy work expected of it.

THE CUTTER HEADS are fitted to a steel spindle, $2\frac{15}{16}$″ diameter and gripped to it with a friction binder; no set-screw point comes in contact with the spindle to mar it; a sufficient number of heads are used to fill the entire length of turning.

THE TABLE carrying the centers is mounted on the main frame upon planed ways, and it slides to and from the cutter heads by hand lever, and it is provided with an adjustable screw at each end for regulating the diameter of turning, which can be quickly changed for doing large or small work.

THE TAIL STOCK has a vertical adjustment and it can be quickly set to suit short or long turning; it also has a right angular adjustment with the table for doing taper turning.

THE MATERIAL to be operated upon is placed between the centers, when the table is moved back from the heads out of harm's way, in which position the head or driving center remains stationary; the table is then moved towards the cutters with the hand lever, and as the object to be turned approaches the heads it is automatically revolved against the cutters and finished. So simple is the operation of this machine that it can be handled by ordinary labor, and where a large number of duplicate turned parts are required it is indispensable, as it not only turns the work true and smooth but makes each piece to exact size and shape.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ × 54″; two No. 2 ball and socket adjustable drop hangers; driver, 30″ × 6″; tight and loose pulleys, 14″ × 6″; speed, 600 rotations per minute; pulley on cutter head spindle, 10″ × 6″; speed, 1,800 rotations per minute.

HORSE POWER to drive, 6; floor space occupied, 37″ × 112″.

No. 3 Improved Iron Bed Wood Turning Lathe.

Export Shipping Weight, 2,700 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 112 Feet.
Cable Word, LAZENO.

No. 3 Improved Iron Bed Wood Turning Lathe.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 112 Feet.

Cable Word, LAZENO.

IT WILL BE OBSERVED by referring to the accompanying engraving that valuable improvements have been made in the design and construction of wood turning lathes not found in machines of this kind heretofore offered. Pattern makers, furniture builders, and woodworkers in general using machines of this kind expect to perform a fine class of turning, consequently the best machines must be employed in order to obtain satisfactory results. We are offering in this lathe a neatness of design, good workmanship, and conveniences that are worthy of careful consideration.

THE BED is ten feet in length, made heavy and deep. It is cast in one piece, with cored center, planed true and finished over the entire upper surface. The outside edges are neatly rounded, while the inner shoulders forming the opening in which the tail stock slides are planed square and parallel, making a neat fit to allow the tail stock to be moved over the bed without cramping, and at all times the head and tail centers will stand in alignment with each other.

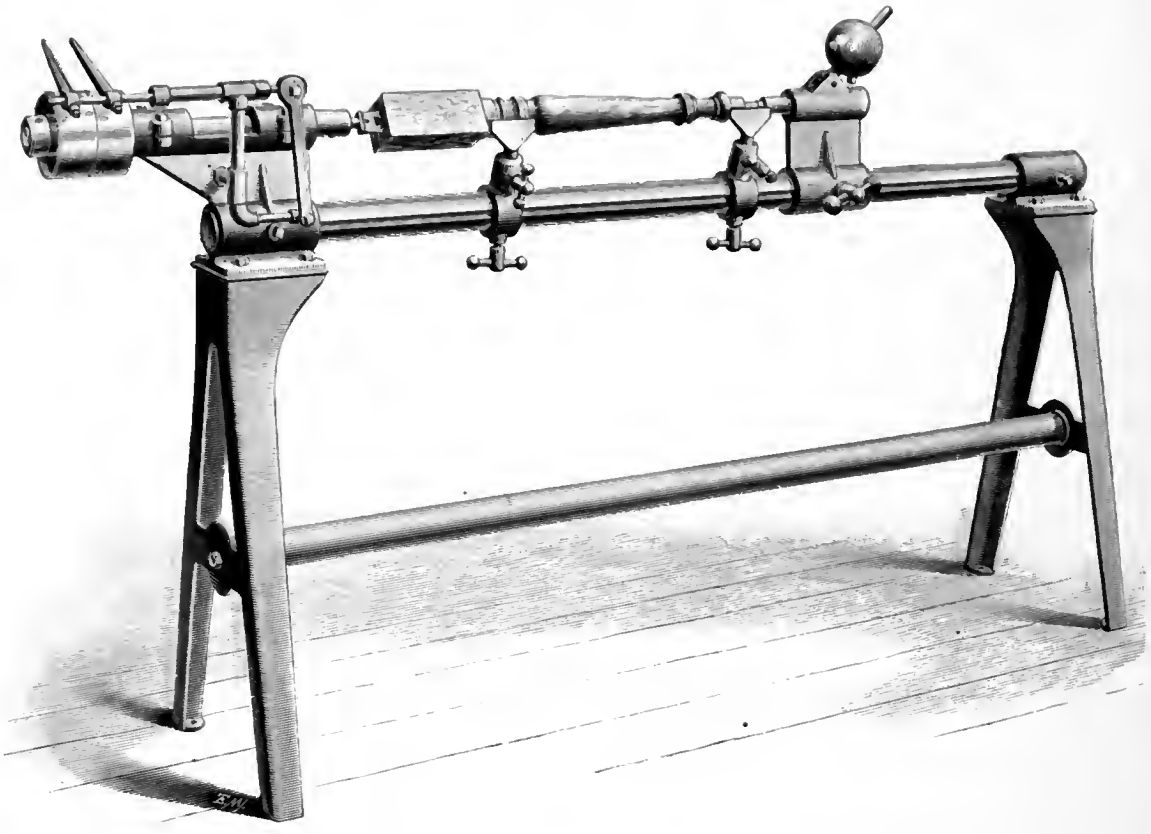
THE HEAD SPINDLE, of heavy hammered steel, runs in large split bronze bearings provided with self-oiling devices. The cone pulley attached to it, of iron, has three steps for various changes of speeds. They are 8″, 10″, and 12″ diameter, for 3″ belt. It is balanced by our centrifugal balancing machine to a perfect running balance for all changes of speed. The front end of the spindle is provided with a screw face-plate and a plain face-plate and the regular equipment of centers. The rear end is provided with a plain face-plate for holding large and small circles. A neat and convenient adjustable floor stand is furnished for the support of the tool, and it is of sufficient weight to stand firm. The upper portion is provided with a swivel for securing a delicate adjustment to or from the work.

THE TAIL SPINDLE can be quickly moved to or from the head spindle by loosening a single screw for short or long work, and it is provided with a cup and taper center.

THIS MACHINE is built in two sizes to swing 20″ and 24″ diameter. It can, however, be furnished to swing larger work if so ordered. It is provided with one each 6″, 12″, and 48″ tool rests, and the necessary oil cups and wrenches.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 40''$; two No. 1 ball and socket adjustable drop hangers, complete with belt shifting apparatus; one three-step cone pulley, 8″, 10″, and 12″, for 3″ belt; the tight and loose pulleys are $10'' \times 4''$; speed, 1,000 revolutions per minute.

HORSE POWER to drive, 1; floor space occupied, $26'' \times 156''$.



No. 1 Improved Turning and Polishing Lathe.

Export Shipping Weight, 500 Pounds.

Net Weight, 300 Pounds.

Cubic Measurement, 45 Feet.

Cable Word, LULU.

THE ACCOMPANYING ENGRAVING represents an Improved No. 1 Wood Turning and Polishing Machine used by pattern makers, furniture builders, handle and neck-yoke manufacturers, etc., for turning and polishing woodwork of various kinds within its capacity.

IT IS built in different lengths to suit the purchaser, and will swing 9½" diameter and under. The entire machine is composed of metal with all the parts accurately fitted.

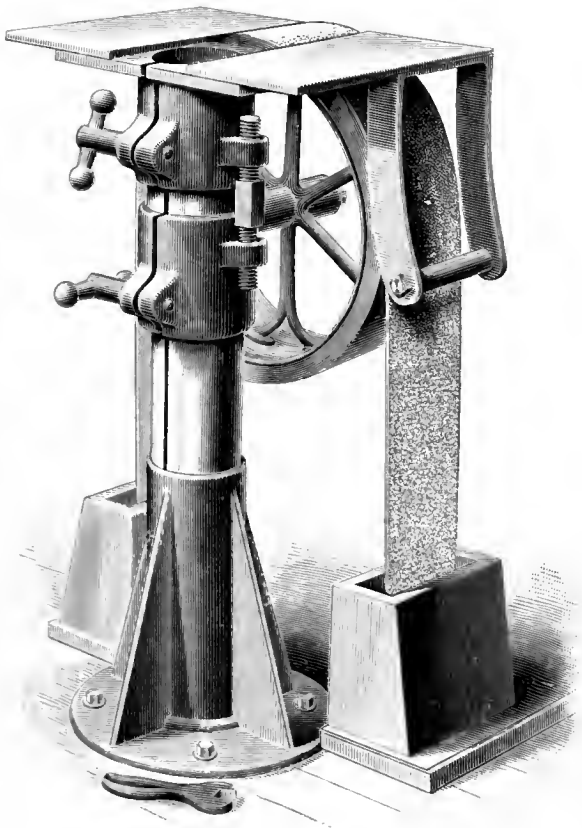
THE HEAD SPINDLE is of steel, large in diameter, and runs in genuine babbitt metal bearings made in halves, with the tight and loose pulleys placed upon the outer end, which can be belted to from above, below, or either side. A neat and convenient belt shipper is furnished with each machine.

THE TAIL STOCK is fitted to a steel shaft $2\frac{7}{16}$" diameter, and it can be quickly adjusted horizontally to or from the head center for short or long turning; the tail center is moved to and from its work by a quick acting ball lever.

THE TOOL RESTS are independent and can be adjusted in every direction.

THE COUNTER is a portion of the machine; the tight and loose pulleys are 5" diameter, 2" face, and should run 2,500 rotations per minute.

HORSE POWER to drive, ½; floor space occupied, 18" × 82".



No. 1 Patent Champion Wood Polishing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 20 Feet.

Cable Word, PERU.

THE ENGRAVING represents a sand belt polishing machine especially intended for wagon, carriage, and agricultural implement builders. It is used for polishing shafts, poles, axles, bolsters, bent and sawed hounds, plow beams and handles, and other classes of work.

THE BODY OF THE MACHINE is of neat design and strongly constructed of a hollow column.

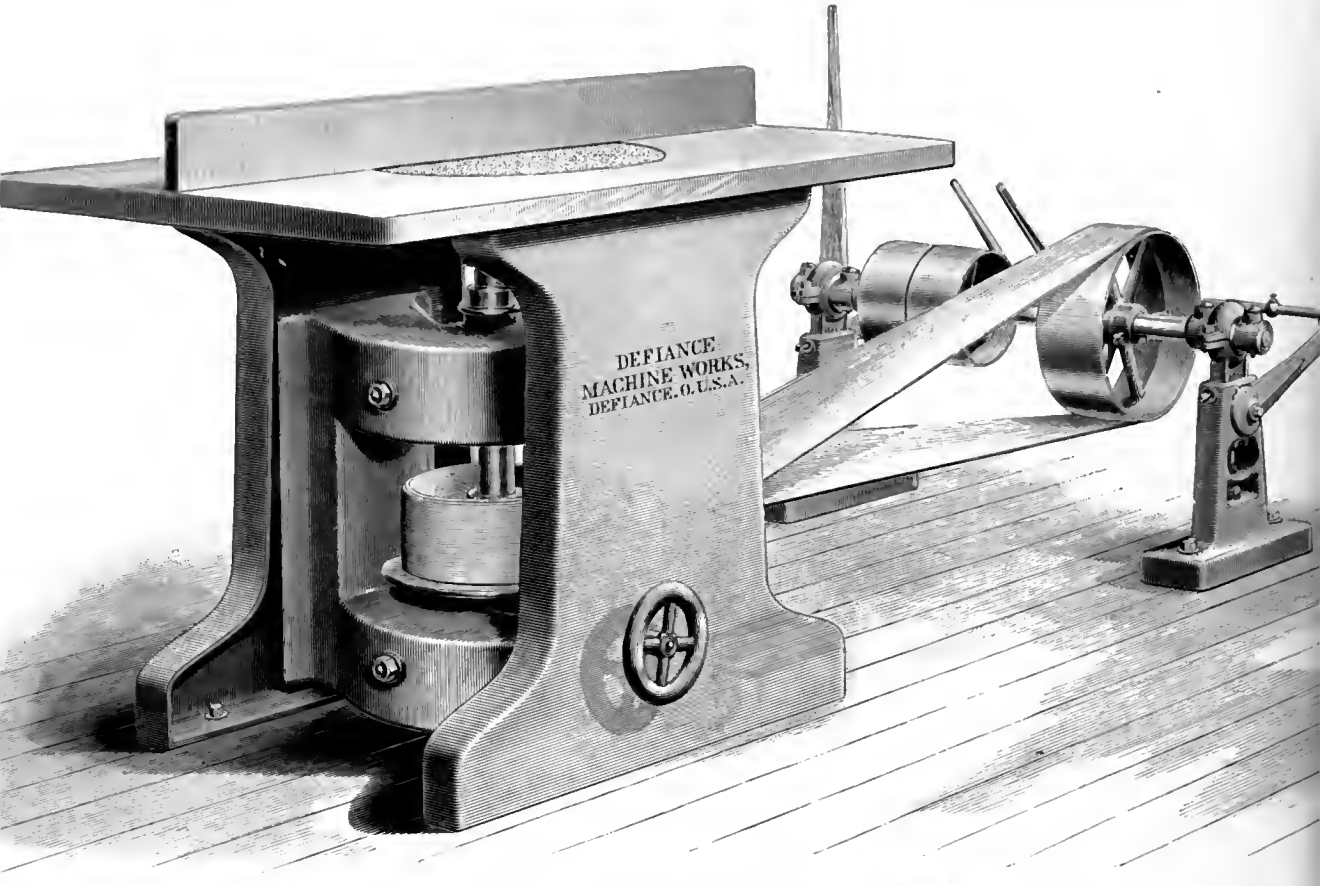
THE UPPER WHEEL is 24″ × 6″ face, covered with a rubber tire ½″ thick, forming an elastic cushion.

THE TABLE, of iron, is fitted to the main frame and it can be adjusted vertically for regulating the depth of cut. The end bracket which projects downward from the table is used to support the material when finishing the end, such as the end of plow beams, wagon tongues, bolsters, etc. The table can be quickly removed from the machine, when it is in proper condition for polishing bent woodwork.

THE SAND BELT is 13 feet long, 6″ wide, and it is strained upward by a right and left hand-screw to tighten the belt, with adjustment sufficient to accommodate a variation of 12″ in length of the belt.

THE COUNTER should be located underneath the floor; the driver is 24″ × 6″; shaft, 36″ × 1½″; two No. 2 drop hangers; tight and loose pulleys, 10″ × 6″; speed, 800 rotations per minute, giving 4,500 feet sand belt speed.

HORSE POWER to drive, 1½; floor space occupied, 24″ × 36″.



No. 6 Improved Disc Sandpapering Machine.

Export Shipping Weight, 2,400 Pounds.
Net Weight, 1,700 Pounds.
Cubic Measurement, 62 Feet.
Cable Word, SELDOM.

THIS MACHINE has been designed for the use of wagon and carriage makers to polish vehicle bodies, seats, axles, sand boards, poles, double-trees, and many other similar forms which heretofore have been finished by hand labor.

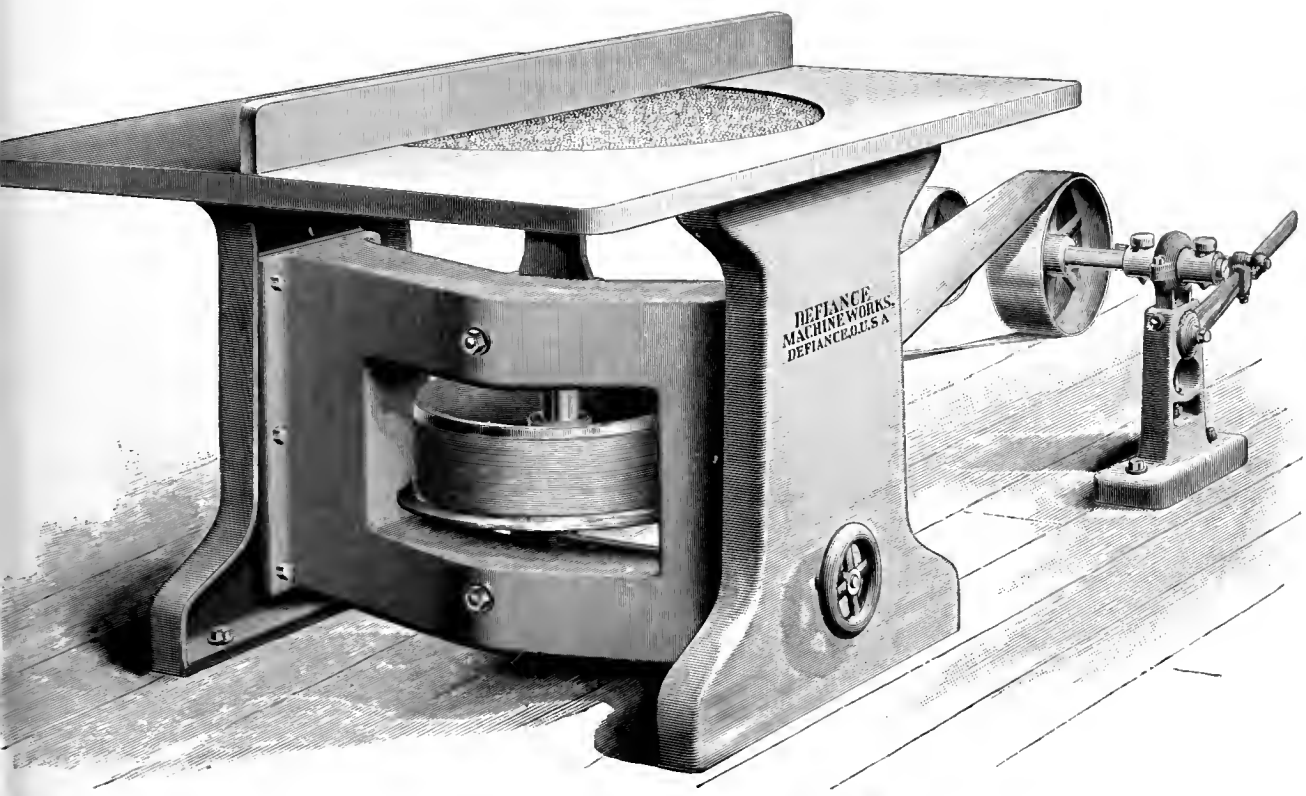
THE TABLE, of iron, is cast in one piece and planed true over the entire upper surface. It is 36″ wide by 54″ long, and the hole in the center is bored out true, with a heavy rib running around the hole on the under side for strength; an adjustable fence crosses the center, allowing two operators to work, one on each side of the machine, at the same time.

THE VERTICAL SPINDLE, carrying the sandpaper disc, is of steel, $2\frac{7}{16}$″ diameter, and it runs in large self-oiling connected bearings, which are attached to the heavy iron frame. All the bearings are so inclosed to prevent the admission of dust and dirt. The hand-wheel shown at the base of the frame is used for vertically adjusting the disc to suit different depths of cut; this adjustment can be effected while the machine is in motion.

THE SANDPAPER DISC is 22″ diameter and covered with a yielding material over which the sandpaper is placed and securely stretched by a friction ring pressed below its cutting surface. By this device the sandpaper can be quickly renewed when worn out.

THE COUNTER consists of the following parts: Shaft, $1\frac{1}{16}$″ × 48″ long; two No. 2 ball and socket adjustable floor stands; driver, 14″ × 5″; tight and loose pulleys, 10″ × 5″; speed, 700 rotations per minute. A convenient belt shifter is furnished as shown by the engraving.

HORSE POWER to drive, 3; floor space occupied, 36″ × 102″.



No. 7 Improved Disc Sandpapering Machine.

Export Shipping Weight, 2,500 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 95 Feet.
Cable Word, SALLOW.

THIS ENGRAVING represents our No. 7 Improved Disc Sandpapering Machine, which has been designed for polishing woodwork. It is used largely by wagon and carriage makers to polish vehicle bodies, seats, axles, sand boards, poles and double-trees. It is equally valuable for the use of furniture and agricultural implement factories, in fact, for polishing any flat surfaces on lumber. It will do the work better and at a great saving over hand finishing.

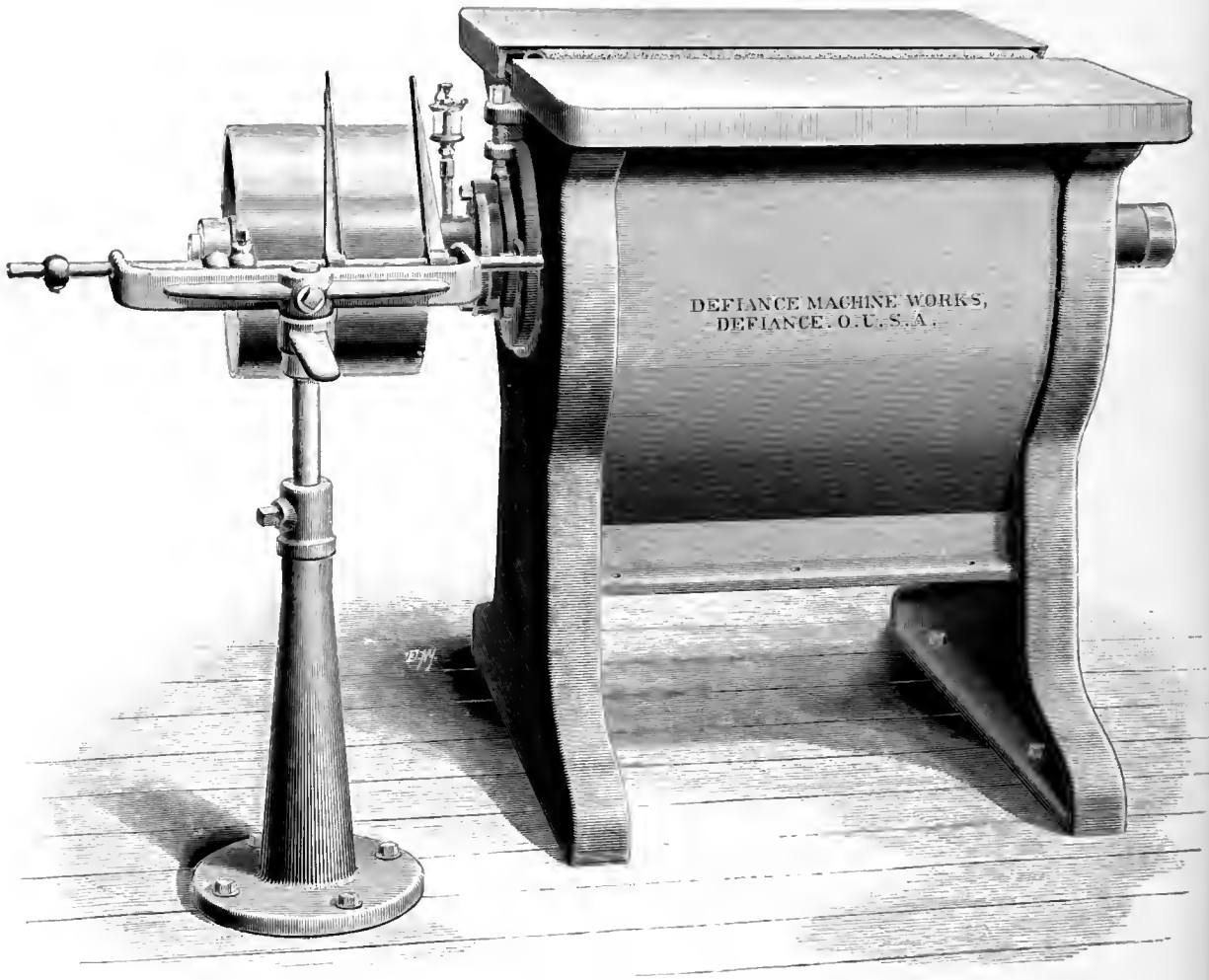
THE TABLE, of iron, is cast in one piece and planed true and smooth on top. It is 48″ wide, 66″ long. The hole in its center for the polishing disc is bored out true. The fence, or gauge, running lengthwise, and in the center of the table, enables two operators to work on the machine at the same time.

THE VERTICAL SPINDLE carrying the sand disc is of steel, $2\frac{7}{16}$″ diameter, and it runs in large self-oiling bearings, which are inclosed to prevent the admission of dust or dirt, and it is provided with a vertical adjustment to regulate the depth of cut, which can be effected while the machine is in motion.

THE POLISHING DISC is 36″ diameter, and covered with a yielding material over which the sandpaper is placed and securely stretched by a friction ring pressed below the cutting surface. By this device the sandpaper can be quickly removed when worn out.

THE COUNTER IS FURNISHED AS FOLLOWS: Shaft, $1\frac{11}{16}$″ × 48″ long; two No. 2 ball and socket floor stands; driving pulley, 14″ × 5″; tight and loose pulleys, 10″ × 5″; speed, 700 rotations per minute.

HORSE POWER to drive, 3; floor space occupied, 48″ × 114″.



No. 1 Improved 24″ Horizontal Hand Feed Sandpapering Machine.

Export Shipping Weight, 1,550 Pounds.

Net Weight, 1,150 Pounds.

Cubic Measurement, 43 Feet.

Cable Word, SENTO.

No. 1 Improved 24″ Horizontal Hand Feed Sandpapering Machine.

Export Shipping Weight, 1,550 Pounds.

Net Weight, 1,150 Pounds.

Cubic Measurement, 43 Feet.

Cable Word, SENTO.

THIS ENGRAVING represents our No. 1 Improved 24″ Horizontal Hand Feed Sandpapering Machine, which has been designed for polishing and finishing woodwork of various kinds, and preparing it ready to receive the varnish or paint.

IT IS a most complete and convenient machine for the use of wagon, carriage, furniture, agricultural implement, and other manufacturers of woodwork; it will polish flat stock, such as boards, etc., and by removing the tables and a portion of the side panels attached to them the polishing drum is exposed, and it can then be used for polishing bent stock and irregular work.

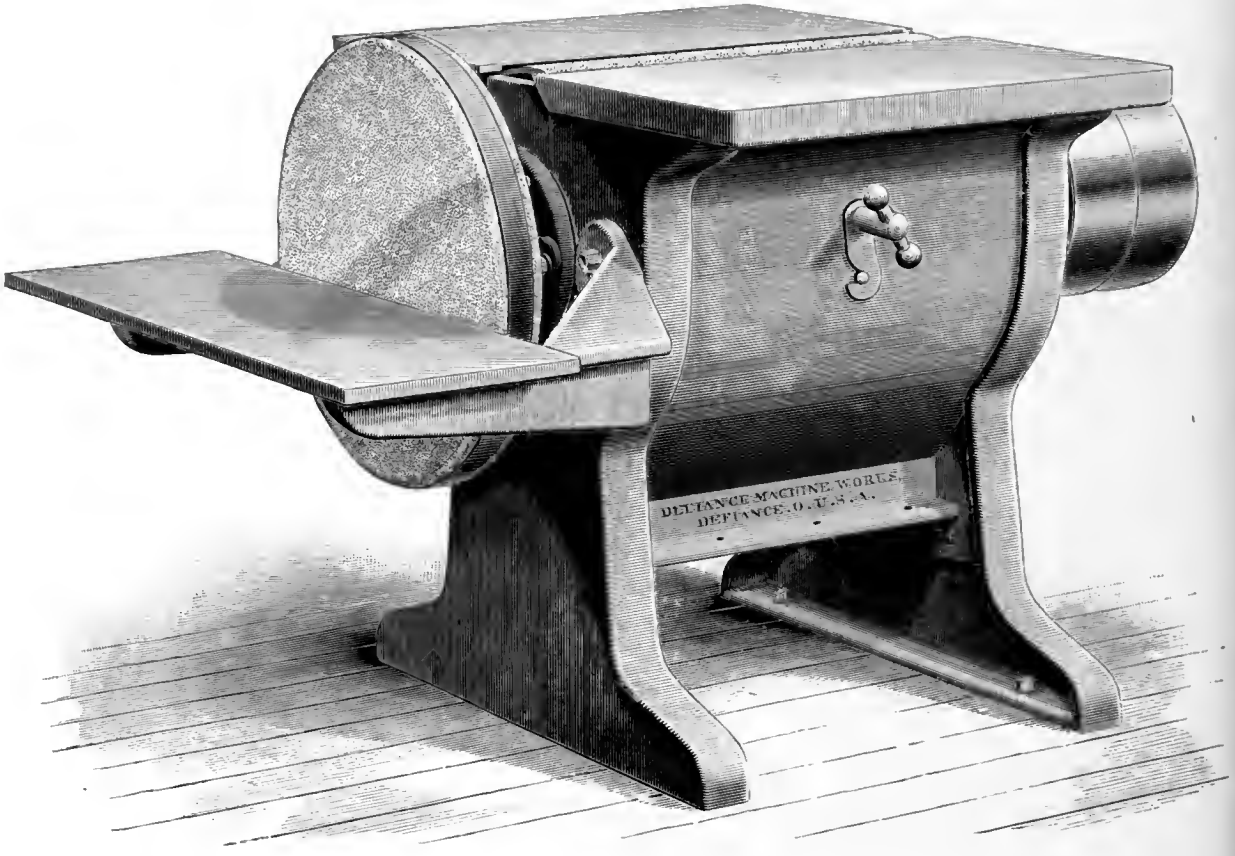
THE FRAME is a substantial iron casting with cored center made dust proof, with an opening at the bottom, which is tapped for blower pipe connection, for the discharge of the dust.

THE TABLES, of iron, are planed true and screwed to the top of the frame so that they can be quickly removed to give free access to the polishing drum and parts.

THE POLISHING DRUM, of iron, 24″ long, is cast in one piece, turned true and balanced to a running balance by our patent centrifugal balancing machine; its outer surface is covered with a felt cushion and over this the sandpaper is stretched; the drum is provided with a vertical adjustment to regulate the depth of cut.

THE TIGHT AND LOOSE PULLEYS are 12″ diameter, 4″ face, and should run 1,000 rotations per minute. It is furnished complete with a convenient belt shifting apparatus, as shown.

HORSE POWER to drive, 2; floor space occupied, 36″×48″.



No. 2 Improved 24″ Horizontal Drum and Disc Sandpapering Machine.

Export Shipping Weight, 1,800 Pounds.

Net Weight, 1,400 Pounds.

Cubic Measurement, 49 Feet.

Cable Word, SPANO.

No. 2 Improved 24″ Horizontal Drum and Disc Sandpapering Machine.

Export Shipping Weight, 1,800 Pounds.

Net Weight, 1,400 Pounds.

Cubic Measurement, 49 Feet.

Cable Word, SPANO.

THIS ENGRAVING represents our No. 2 Improved 24″ Horizontal Drum and Disc Sandpapering Machine which has been designed for polishing and finishing woodwork of various kinds and preparing it ready to receive the varnish or paint.

THIS MACHINE is recommended for the use of wagon, carriage, agricultural implement, furniture, and other manufacturers of woodwork. It will polish flat stock up to 24″ wide. By removing the tables, which requires but a moment's time, the polishing drum is exposed, and it can then be used for polishing bent stock and irregular work.

THE FRAME is a heavy casting with cored center, made dust proof, provided with an opening at the bottom for exhaust pipe connection for the discharge of dust.

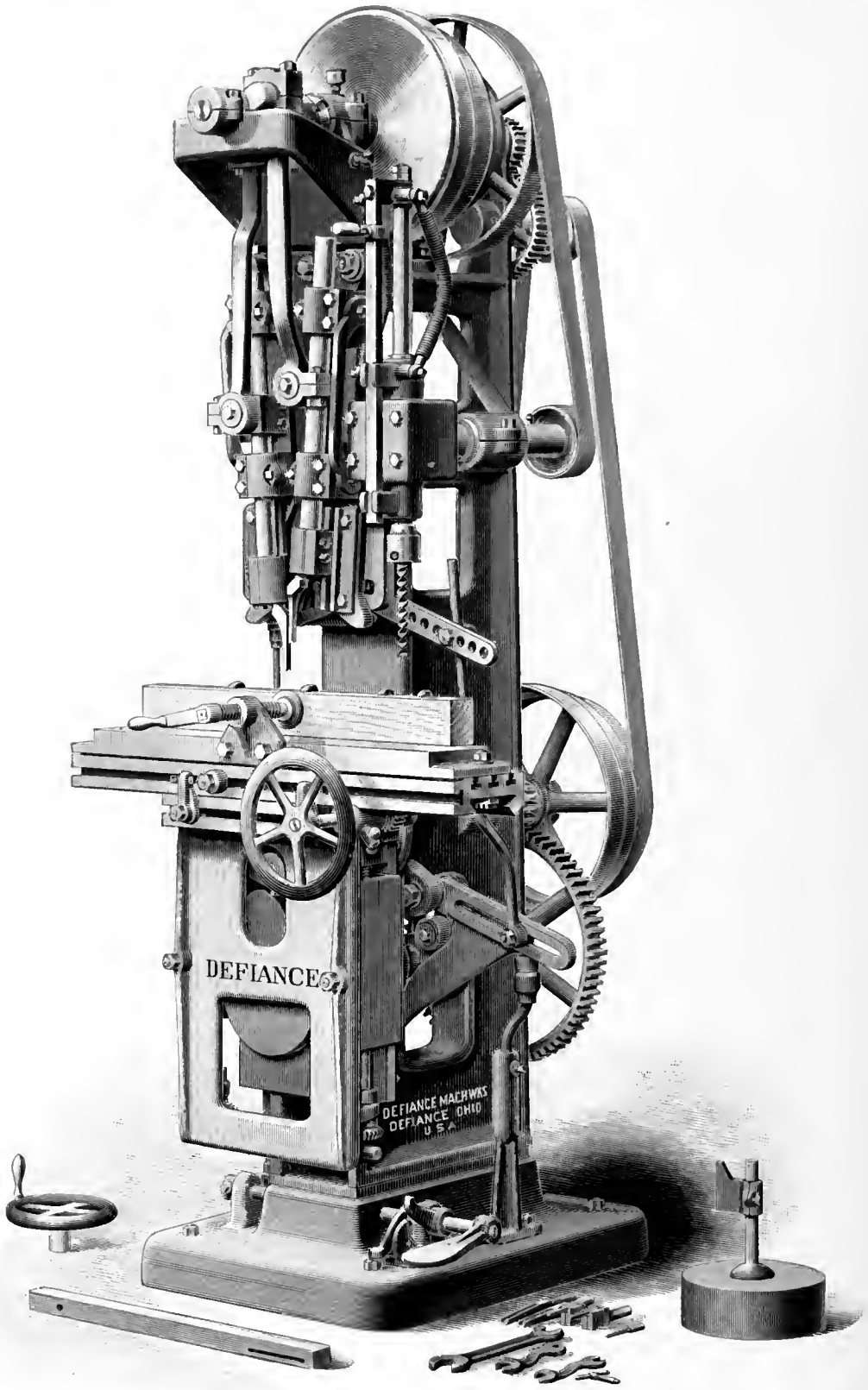
THE TABLES are of iron, planed true, and easily removed to give free access to the drum and parts.

THE POLISHING DRUM, of iron, is 24″ wide, turned true and balaneed by our patent balancing system. Its outer surface is covered with a felt cushion, and over this the sandpaper is stretched by a simple and quick method. The drum is provided with a vertical adjustment to regulate the depth of cut.

THE POLISHING DISC is 22″ diameter, and its face is covered with a felt cushion, and over this the sandpaper is stretched and held in position by a friction ring. The table in front of it is of iron, planed true, and it is large and roomy.

THE TIGHT AND LOOSE PULLEYS are 12″ diameter, 4″ face, and should run 1,000 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 36″×64″.



No. 6 Patent Automatic Double Chisel Mortising and Boring Machine.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 113 Feet.
Cable Word, MONEY.

No. 6 Patent Automatic Double Chisel Mortising and Boring Machine.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 113 Feet.
Cable Word, MONEY.

THIS ENGRAVING represents our No. 6 Patent Automatic Double Chisel Mortising and Boring Machine, designed for rapidly cutting mortises and boring either hard or soft wood. It is capable of cutting mortises from ⅛″ up to 1½″ wide in different lengths up to 6″, such as required in wagon, carriage, furniture, agricultural implement and other wood-working shops.

THE FRAME is large and heavy, with the driving power at the top. It has two chisel bars arranged side by side upon the front of the column, their axis being on a vertical plane at right angles to the axis of the main shaft.

THE BORING APPARATUS is contained within an iron case which completely covers the gears, and is so constructed that the center of the auger is always exactly in line with the center of the chisels, so that the object after being bored has only to be moved laterally to bring it in proper place under the chisels to receive the mortise. The boring spindle can be used as a separate boring machine and adjusted to any angle required.

THE TABLE on which the timber rests has a screw clamp for holding the work. It has a longitudinal and transverse right angular adjustment for regulating the position of the mortise to be made. The bed upon which the table rests is gibbed to the front of the main frame, and is elevated to the chisels by a lifting cam operating on a friction roller.

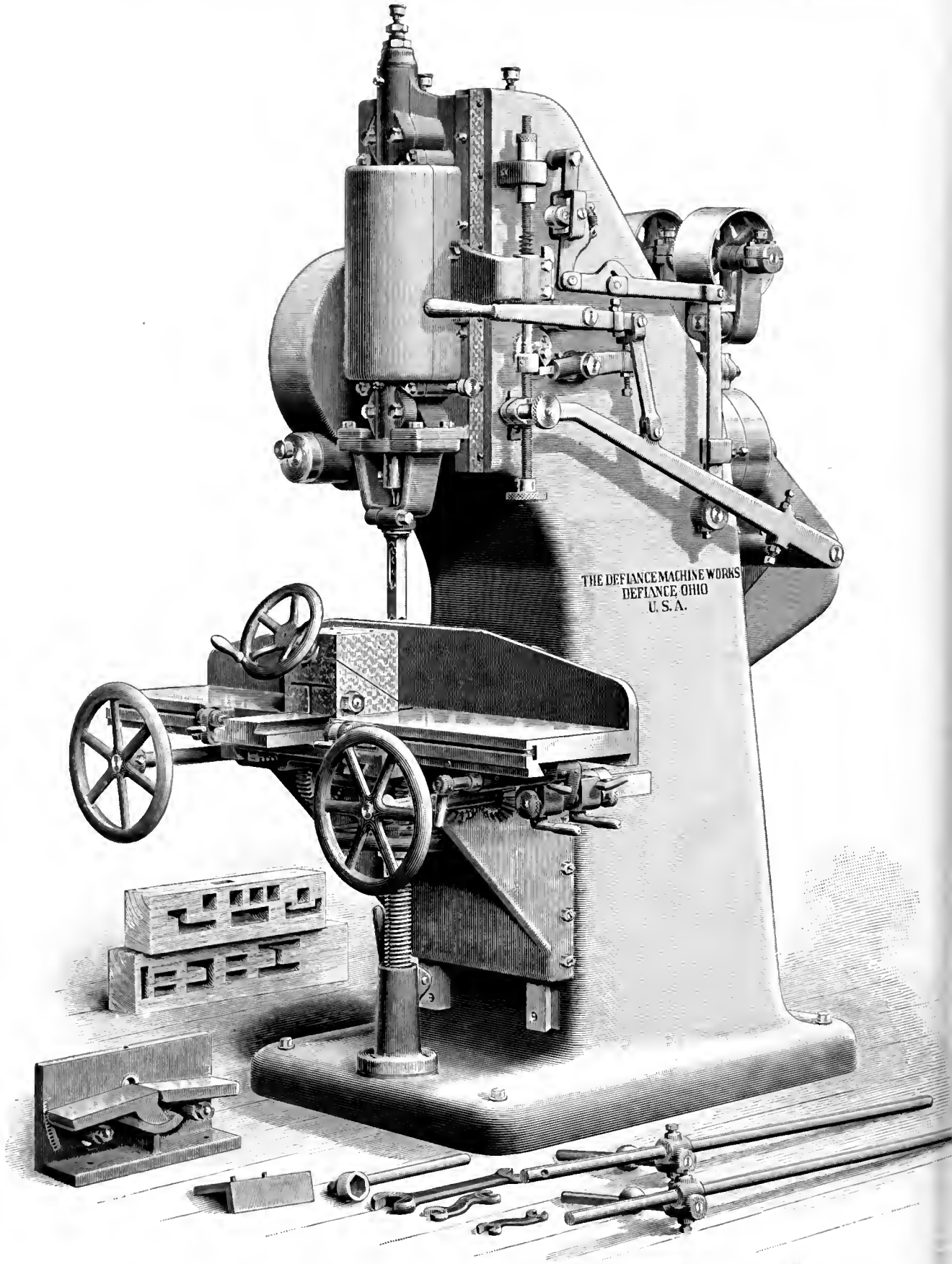
THE MATERIAL TO BE MORTISED is clamped in a vise and it is automatically presented to the action of the chisels by a vertical movement of the bed; when a mortise is cut it descends by its own gravity.

THE OPERATOR has complete control over the machine from the working side; the friction clutch at the top of the machine is connected by foot lever. The weight of the operator's foot upon the lever instantly starts the chisel bars, and the table carrying the work to be mortised is gradually lifted to the chisels until the full depth of the cut is reached, where it remains stationary until the mortise is completed, when it descends ready for the next mortise, the feeding being entirely automatic.

IT WILL CUT 6,000 medium sized mortises in soft wood in ten hours, without a variation in the dimensions of the mortises of $\frac{1}{1000}$″ from a specific measurement. It will make mortises tapering in either direction, or parallel, as desired, or tapering at one end and perpendicular to the surface at the other end. No painstaking, difficult, and uncertain gigging of a carriage is required, and no reversing of chisels.

THE DRIVING PULLEY on the machine is 16″ diameter, 3″ face, and should run 370 turns per minute. The pulley on the main line by which it is driven should have a 3″ crowning face.

HORSE POWER to drive, 2; floor space occupied, 36″ × 36″.



No. 1 Patent Automatic Vertical Hollow Chisel Mortising Machine.

Export Shipping Weight, 5,100 Pounds.
Net Weight, 4,300 Pounds.
Cubic Measurement, 176 Feet.
Cable Word, MINEHA.

No. 1 Patent Automatic Vertical Hollow Chisel Mortising Machine.

Export Shipping Weight, 5,100 Pounds.
Net Weight, 4,300 Pounds.
Cubic Measurement, 176 Feet.
Cable Word, MINEHA.

THIS ENGRAVING represents our No. 1 Patent Automatic Vertical Hollow Chisel Mortising Machine, designed for cutting mortises in either hard or soft wood. It has been designed for the use of manufacturers of wagons, agricultural implements, railway cars, ship builders, and various other woodworkers. The principle involved is the use of an auger revolving within a square hollow chisel attached to a vertically moving ram which is fed down to the work; a single movement produces a clean square mortise, corresponding to the exact size of the tools used. By moving the table horizontally and at right angles with a single auger and chisel, mortises of various widths and lengths can be cut, although one each ⅝″, ¾″, ⅞″, and 1″ augers and chisels are furnished with each machine.

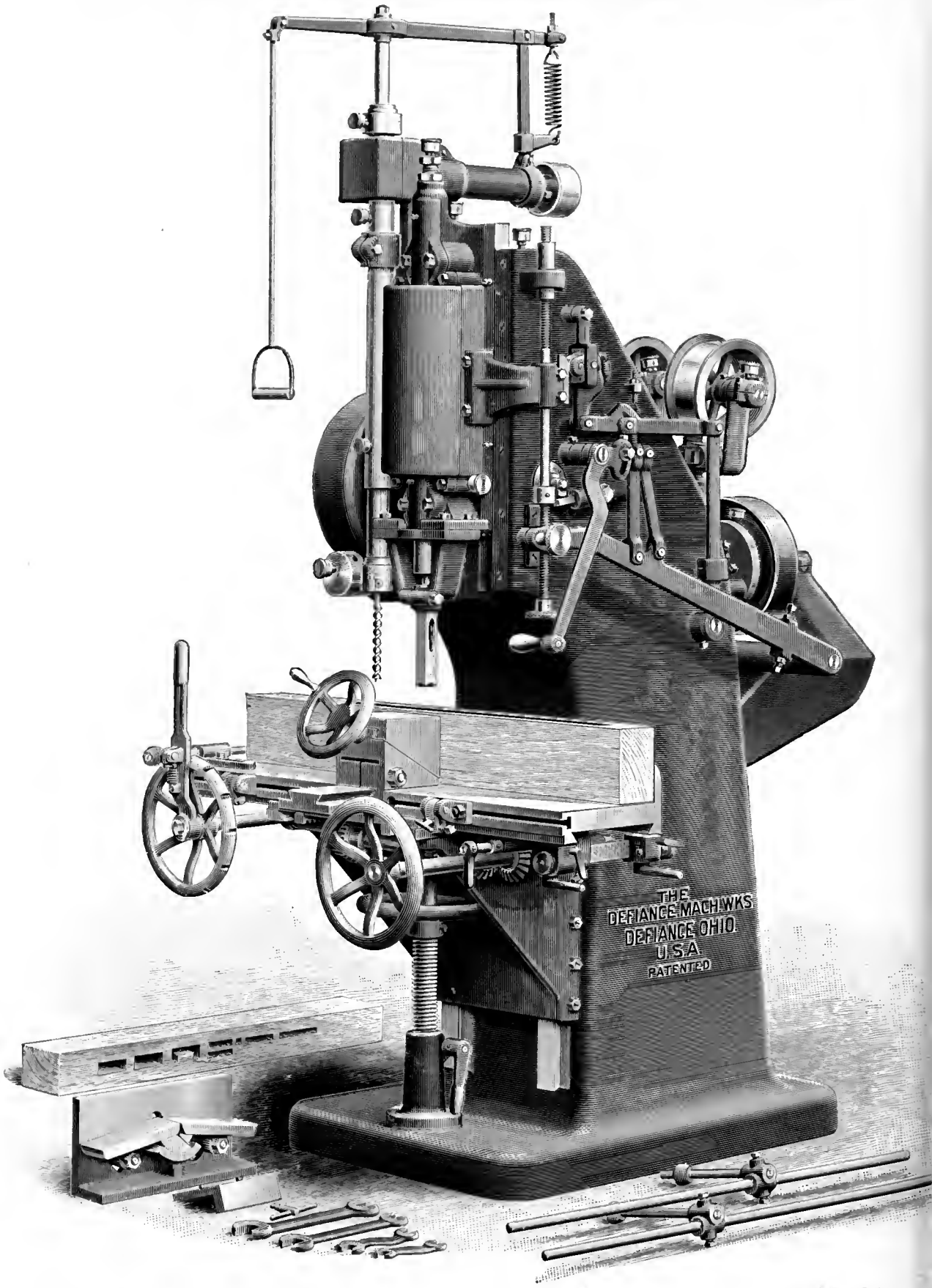
THIS MACHINE contains many new patented improvements. All the working parts are outside of the frame in plain view and easy of access, which is a most desirable feature. The ram has a quick return and it is balanced in any position without the use of weight or spring, and it is entirely noiseless in its operation. The table is provided with a system of stops and gauges for laying off the work.

THE FRAME is a massive casting in one piece, with cored center and a broad base. It is original in design and of sufficient strength to do the very heaviest class of mortising with ease. The ram to which the auger and chisel are attached is thoroughly gibbed to the frame in planed and scraped angle ways, and it is reciprocated vertically by means of a heavy worm gear and screw running in a reservoir of oil and driven by a double friction clutch. The auger spindle extending up through the center runs in self-lubricating bearings. The top end rotates against an adjustable bronze screw to support the end thrust, and it is also self-lubricating. The pulleys for driving the auger spindle are so constructed to automatically maintain the proper tension to the belt at all times. The ram has a stroke up to 10″, and its position is controlled by a convenient hand lever, a slight movement of which instantly starts or stops the feed or reverses it at any point. The depth of mortise can be changed instantly while the machine is in motion, by means of a screw adjustment. It has four rates of feed with a quick return motion, enabling the machine to cut mortises in either hard or soft wood as large as 2″ square at a single stroke.

THE COMPOUND TABLE is thoroughly gibbed to the front of the frame, and it is supported upon a heavy steel screw operated by a convenient hand-wheel for raising and lowering the table. To the table patent stops with micrometer adjustment are fitted to facilitate the duplication of mortises, and they can be instantly lifted up out of the way and the table moved in either a longitudinal or lateral direction and returned to its original position without destroying any of the adjustments. A chuck is furnished for angle mortising and it is laid off to 20 degrees. Gauges are also supplied for gauging from the end of the work or from a mortise. A powerful adjustable clamp is fitted to the table for holding the work. It will accommodate stock 12″ × 15″ square and the machine will cut mortises in any position in a piece of timber of this size or any size under.

THE COUNTER is furnished as follows: Shaft, 96″ long x 1⅞″ diameter; three No. 2 J. drop hangers; one pulley 30″ x 7½″, with 12″ x 5″ driver on the hub and 12″ x 5″ loose pulley of same size on the shaft; speed, 740 revolutions per minute; two pairs tight and loose pulleys, 12″ x 6″; speeds, 300 and 400 revolutions; one pulley, 18″ x 3½″, for running the ram up; one pulley, 10″ x 4½″, for running the ram down.

HORSE POWER to drive, 3; floor space occupied, 48″ x 70″.



No. 10 Patent Automatic Vertical Hollow Chisel Mortising and Boring Machine.

Export Shipping Weight, 5,500 Pounds.
Net Weight, 4,700 Pounds.
Cubic Measurement, 181 Feet.
Cable Word, MELBA.

No. 10 Patent Automatic Vertical Hollow Chisel Mortising and Boring Machine.

Export Shipping Weight, 5,500 Pounds.
Net Weight, 4,700 Pounds.
Cubic Measurement, 181 Feet.
Cable Word, MELBA.

THIS ENGRAVING represents our No. 10 Patent Automatic Vertical Hollow Chisel Mortising and Boring Machine, designed for cutting mortises in either hard or soft wood. It has been designed for the use of manufacturers of wagons, agricultural implements, railroad cars, ship builders and various other woodworkers requiring a rapid and accurate machine. The principle involved is the use of an auger revolving within a hollow chisel attached to a vertically moving ram, which is fed down to the work. A single movement produces a clean, square mortise corresponding to the exact size of the chisel used. By moving the table horizontally and at right angles with the single auger and chisel, mortises of various widths and lengths can be cut.

THIS MACHINE contains many new patented improvements. All the working parts are outside of the frame in plain view and easy of access, which is a most desirable feature. The ram has a quick return, it is balanced in any position without the use of weight or spring, and is entirely noiseless in its operation. The table is provided with a system of stops and gauges for laying off the work, and is capable of doing 25 per cent. more work than any machine so far offered.

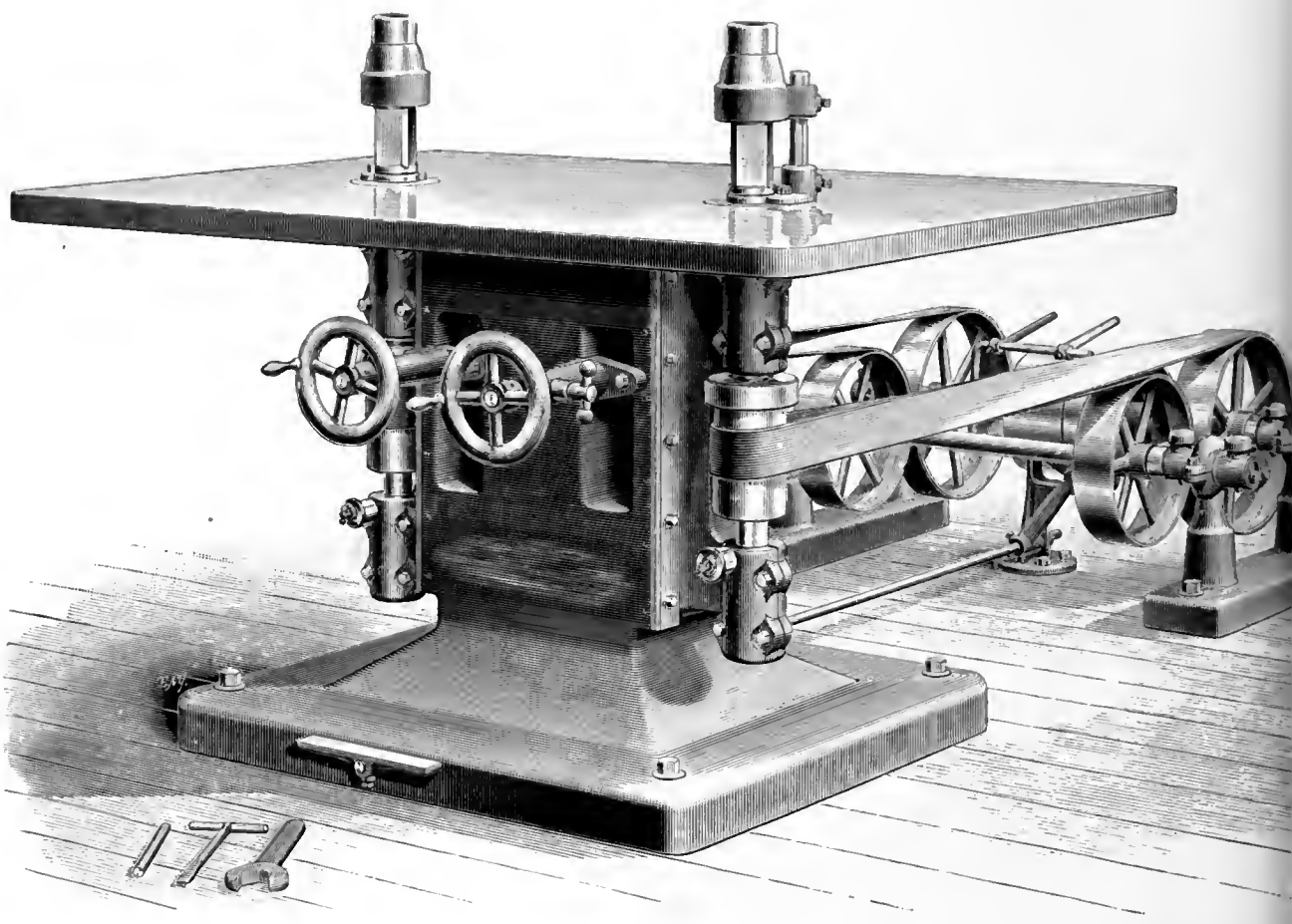
THE FRAME is a massive casting in one piece, with cored center and a broad floor base. It is original in design and of sufficient strength to do the very heaviest class of mortising with ease. The ram to which the auger and chisel are attached is thoroughly gibbed to the frame in planed and scraped angleways, and it is reciprocated vertically by means of a heavy worm gear and screw running in a reservoir of oil and driven by a double friction clutch. The auger spindle extending up through the center runs in self-lubricating bearings. The top end rotates against an adjustable bronze screw to support the end thrust, and it is also self-lubricating. The pulleys for driving the auger spindles are so constructed as to automatically maintain the proper tension to the belts at all times. The ram has a stroke up to 10″ and its position is controlled by a convenient hand lever, a slight movement of which instantly starts or stops the feed or reverses it at any point. The depth of mortise can be changed instantly while the machine is in motion. It has four rates of feed with a quick return motion and will cut mortises in hard or soft wood up to 2″ square at a single stroke.

THE AUXILIARY BORING DEVICE is most convenient and answers the purpose of a regular boring machine, boring holes as large as 2½″ in diameter.

THE COMPOUND TABLE is thoroughly gibbed to the front of the frame, and it is supported upon a heavy steel screw operated by a convenient hand wheel for raising and lowering the table. To the table patent stops with micrometer adjustment are fitted to facilitate the duplication of mortises, and they can be instantly lifted up out of the way and the table moved in either a longitudinal or lateral direction and returned to its original position without destroying any of the adjustments. A chuck is furnished for angle mortising and it is laid off to 20 degrees. Gauges are also supplied for gauging from the end of the work or from the mortise. A powerful adjustable clamp is fitted to the table for holding the work, and it will accommodate stock 12″ × 15″ square, and the machine will cut mortises in any position in a piece of timber of this size or any size under.

THE COUNTER is furnished as follows: Shaft, 96″ long × 1 15/16″ diameter; three No. 2 J drop hangers; one pulley, 30″ × 7½″, with 12″ × 5″ driver on the hub and 12″ × 5″ loose pulley of same size on the shaft; speed, 740 revolutions per minute; two pairs tight and loose pulleys, 12″ × 6″; speeds, 300 and 400 revolutions; one pulley, 18″ × 3½″, for running the ram up; one pulley, 10″ × 4½″, for running the ram down.

HORSE POWER to drive, 3; floor space occupied, 48″ × 70″.



No. 4 Double Spindle Upright Shaping Machine.

Export Shipping Weight, 2,800 Pounds.

Net Weight, 2,200 Pounds.

Cubic Measurement, 84 Feet.

Cable Word, SPHERE.

No. 4 Double Spindle Upright Shaping Machine.

Export Shipping Weight, 2,800 Pounds.

Net Weight, 2,200 Pounds.

Cubic Measurement, 84 Feet.

Cable Word, SPHERE.

THIS ENGRAVING represents our Improved No. 4 Heavy Double Spindle Upright Shaping Machine, which has been designed for shaping irregular forms; it is massive and heavy and adapted to a large variety of work required in wagon, carriage, agricultural implement, car, and general wood-working shops.

THE FRAME is a substantial casting in one piece, with cored center of sufficient strength to overcome all tendency to twist or spring the bed, and an easy, unerramped movement of the working parts is secured.

THE CUTTER HEAD SPINDLES, of steel, are 2″ diameter, and rotate in heavy bearings, with connected boxes, which are gibbed to the main frame, and they have a vertical adjustment by the use of the hand-wheels shown. The spindles are 28″ apart from center to center, and they are fitted with one pair of 3″ flanged cutter heads with 3″ straight-faced knives. Cutters of various sizes and shapes can be used. An improved safety-guard covers the top of each head, which prevents the operator from coming in contact with the cutters.

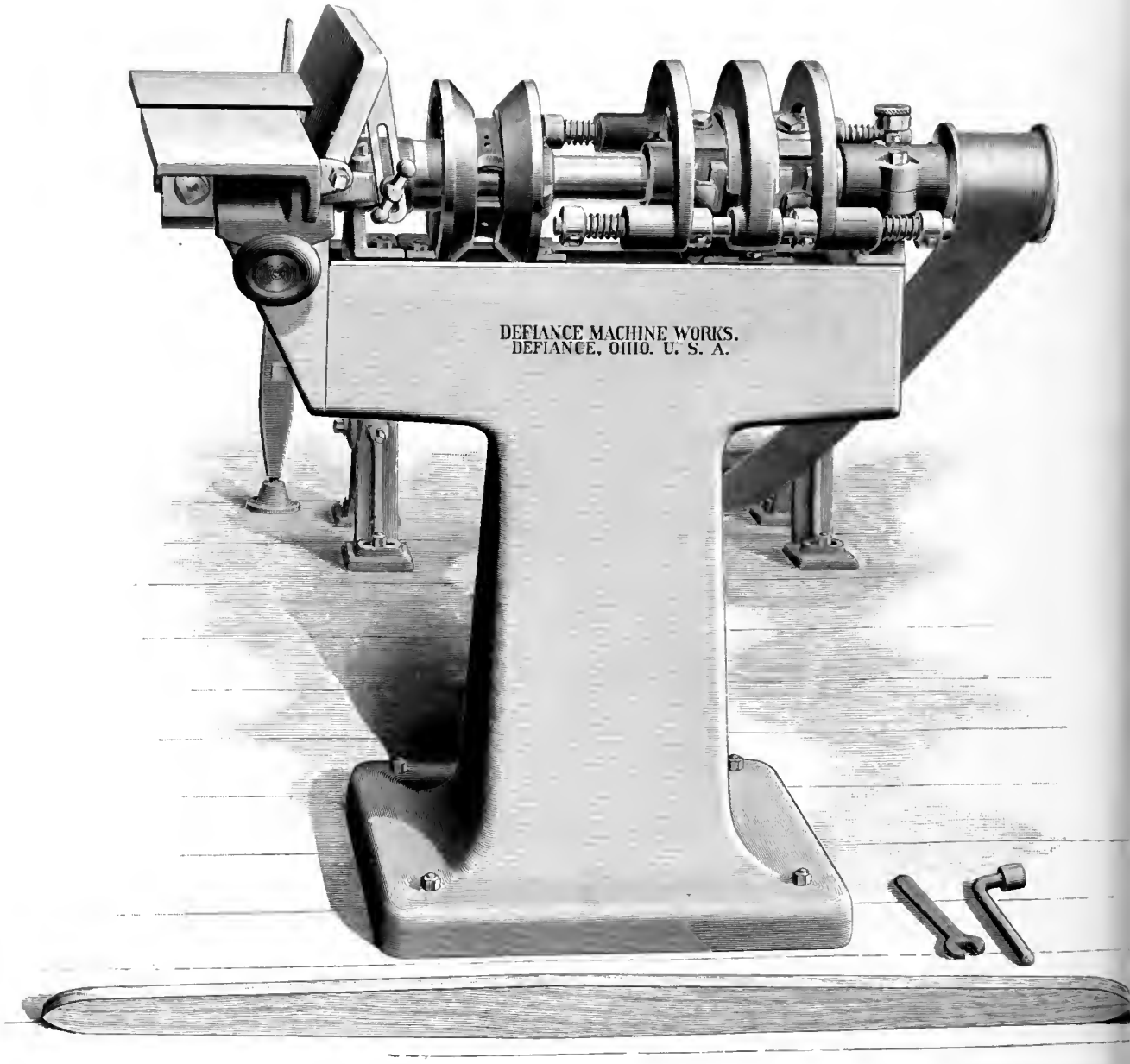
THE TABLE, of iron, is cast in one piece and planed true; it is 60″ long, 46″ wide. An extra table of the same size can be furnished and attached to the rear side of the regular table to accommodate extra long and heavy work.

THIS MACHINE, when so ordered, can be furnished with wabble saws on the cutter head spindles, and a sweep attached to the table, which can be adjusted to different circles, to be used for the purpose of dressing the inside and tread of sawed felloes for vehicle wheels. With this attachment, 2,000 felloes can be dressed up square and true in ten hours.

THE DOUBLE COUNTERSHAFT enables the drive belts to properly track over the pulleys, and prevents the belts from jumping or flopping, which secures a smooth speed to the cutters, and enables better work to be obtained.

A CONVENIENT FOOT TREADLE is used for starting and stopping the machine. The tight and loose pulleys are 10″ diameter, 5″ face, and should run 1,200 rotations per minute.

HORSE POWER to drive, 4; floor space occupied, 60″×96″.



No. 3 Patent Horizontal Shaping, Planing, and Cornering Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 45 Feet.

Cable Word, SOTOFA.

No. 3 Patent Horizontal Shaping, Planing, and Cornering Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 45 Feet.
Cable Word, SOTOFA.

THIS ENGRAVING represents our No. 3 Patent Horizontal Shaping, Planing, and Cornering Machine, which has been designed for shaping irregular forms to pattern, as well as for planing flat surfaces, and rounding, chamfering, and cornering. It is a combination of three machines in one. It covers a large variety of work required in wagon, carriage, agricultural implement, shaft, pole, single-tree, gear, sleigh, felloe, and general wood-working factories.

THE FRAME is a substantial casting in one piece, with cored center and a broad floor base to stand firm.

THE CUTTER HEAD SPINDLE, of steel, $1\frac{1}{16}''$ in diameter, runs in long, self-lubricating bearings with the driving pulley at the end.

THE TWO SHAPING HEADS are each equipped with four knives and provided with an ingenious system of guides for shaping the work to pattern. They are turned true and bored out on the inside, so that the knives can be set close up to the work. The center guide between the heads is stationary; it is fitted with a collar on each side upon which the pattern rides, and the material to be shaped is held true and in proper position by the outside guides, which are brought to bear against the sides of the material by a soft spring tension. Sufficient adjustment can be secured to the side guides for narrow or wide work. By the use of the two shaping heads and the double guides, the work to be shaped, when cross grained, can be reversed and handled from one head to the other, similar to the use of a Double Spindle Upright Shaping Machine. In fact, these heads will do the same variety of work as the upright shaper, and more of it, without danger of injuring the operator.

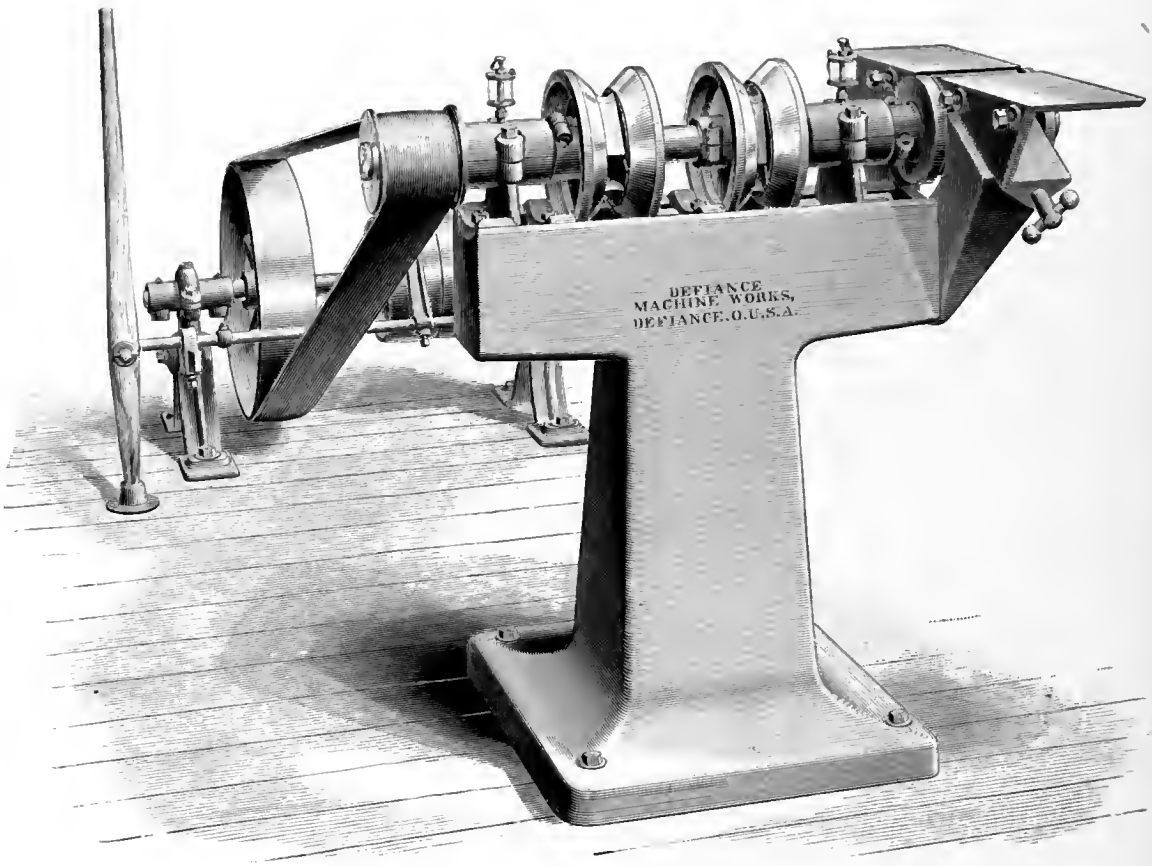
THE ROUNDING AND CORNERING HEAD is surrounded with guides having a horizontal adjustment to regulate the depth of cut and width of work. They are turned true and beveled to 90 degrees angle, so that square material to be rounded or chamfered will rest between the guides with a true bearing on either side. The cutters in this head can be used with straight or circular cutting edges, different in widths to suit the class of the work expected of them.

THE 6-INCH PLANER HEAD carries three knives, and it is supplied on each side with an adjustable iron table, which is planed true and provided with a vertical adjustment by hand wheel and screw to set them up or down to regulate the depth of cut. The beveling fence can be set to any angle required for square or beveled work. This attachment will plane material 6″ wide and under.

IT WILL shape, plane, round, and chamfer either hard or soft wood and do it rapidly and smooth, and it is the most convenient and useful machine that can be employed in a wood-working factory.

THE COUNTER is furnished as follows: Shaft, 36″ long, $1\frac{11}{16}''$ diameter; two No. 1 adjustable ball and socket drop hangers; driving pulley, 20″ diameter, 4″ face; tight and loose pulleys, 10″ diameter, 4″ face; speed, 760 rotations per minute. Pulley on cutter head spindle, 4″ in diameter, 4″ face; speed, 3,800 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 36″ × 38″.



No. 0 Patent Rounding, Chamfering, and Cornering Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 29 Feet.

Cable Word, ROANOKE.

No. 0 Patent Rounding, Chamfering, and Cornering Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 29 Feet.

Cable Word, ROANOKE.

THIS ENGRAVING represents an improved No. 0 Rounding, Chamfering, and Cornering Machine, with 6″ buzz planing attachment. It is used by wagon, carriage, sleigh, shaft, pole, felloe, gear, and agricultural implement manufacturers to shape and plane wagon poles, shafts, felloes, plow beams and handles, double-trees, single-trees, and a large variety of other similar work. It can be fitted with a boring attachment when so ordered.

IT IS more easily handled, not so dangerous, and will perform more and better work than can be secured with an upright shaping machine.

THE FRAME is cast in one piece with cored center; it is neat in design and very substantial, and is capable of withstanding heavy and rapid work.

THE GUIDES which surround the cutter heads are bored out true on the inside so that the cutting edges of the knives can be set up close to the work; the outside is also turned true and beveled to 90 degrees angle, so that square material to be rounded or chamfered will have a true bearing on both sides in order to secure accurate work; the bottom of the guides rest in planed ways on top of the main frame, and they can be adjusted to or from each other for regulating the depth of cut by loosening a single screw.

THE CUTTER HEAD SPINDLE is of forged steel, $1\frac{1}{16}$″ diameter, and runs in genuine babbitt metal, self-lubricating bearings.

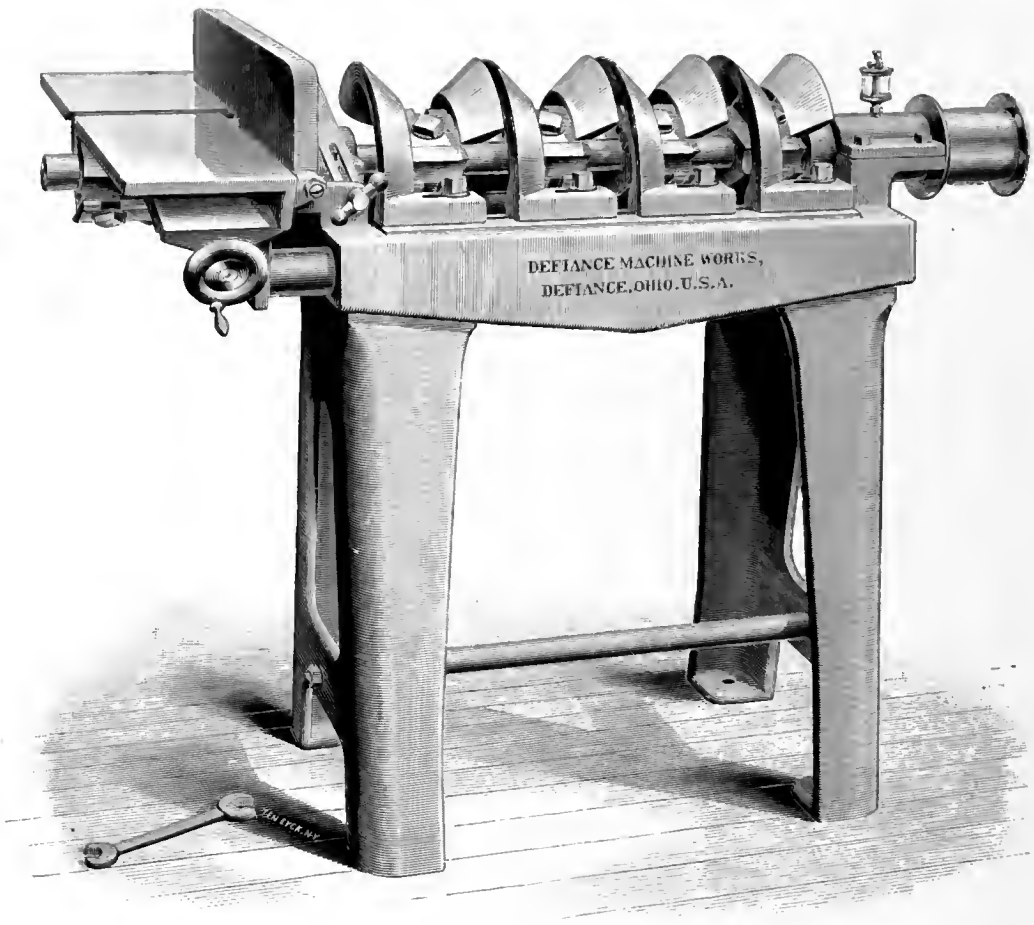
THE TWO ROUNDER HEADS are each fitted with three knives, which are supplied with chip breakers of an improved kind; knives from $\frac{3}{4}$″ up to 4″ wide can be used, either with straight cutting edges for chamfering and cornering, or with semi-circular edges for the various classes of rounding.

THE 6″ PLANER ATTACHMENT is also fitted with three knives and chip breakers and provided with an iron table on each side, which can be adjusted up or down by hand-screw, for regulating the depth of cut. Cap screws are provided for holding wooden guides of various kinds. This attachment will be found very useful for squaring up shafts, poles, single-trees, double-trees, plow handles and beams, and general jointing. Round faced knives can be used in this head for making wider and larger rounds than can be accomplished with the rounder heads. The table is supplied with a beveling fence same as used on the No. 1 machine for square or angular work.

IT WILL shape and plane wagon and carriage shafts and poles, felloes, plow beams and handles, single-trees, double-trees, and other similar work, either regular or irregular in form, in a smooth and satisfactory manner, and it is the most useful machine that can be used in a wood-working factory of this class.

THE COUNTER is furnished, as follows: Shaft, $36″ \times 1\frac{11}{16}″$; journals, $1\frac{7}{16}″$; two No. 1 ball and socket adjustable hangers; driver, $20″ \times 4″$; tight and loose pulleys, $10″ \times 4″$; speed, 760 rotations per minute; pulley on cutter head spindle, $4″ \times 4″$; speed, 3,800 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, $36″ \times 60″$.



No. 1 Patent Rounding, Chamfering, and Cornering Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 27 Feet.

Cable Word, RICHMOND.

No. 1 Patent Rounding, Chamfering, and Cornering Machine.

Export Shipping Weight, 1,000 Pounds,

Net Weight, 700 Pounds.

Cubic Measurement, 27 Feet.

Cable Word, RICHMOND.

THIS MACHINE is used by wagon, carriage, sleigh, gear, shaft, pole, and agricultural implement manufacturers for rounding, chamfering, and planing woodwork, such as shafts, poles, felloes, gearing, double-trees, plow beams and handles, sleigh, wagon, and carriage parts.

IT WILL be seen from the engraving that the frame, of iron, is well proportioned, and of sufficient weight and strength to endure rapid and heavy work.

THE SPINDLE, of forged steel, is $1\frac{5}{8}$" diameter, running in large genuine babbitt metal, self-lubricating bearings; it is fitted with four rounding heads, each carrying knives of different widths, from $1\frac{1}{2}$" to 3" wide, to cover the different sizes of work intended for rounding, chamfering, and cornering. Each knife is supplied with a chip breaker, of an improved kind, to prevent tearing the material or lifting the fiber.

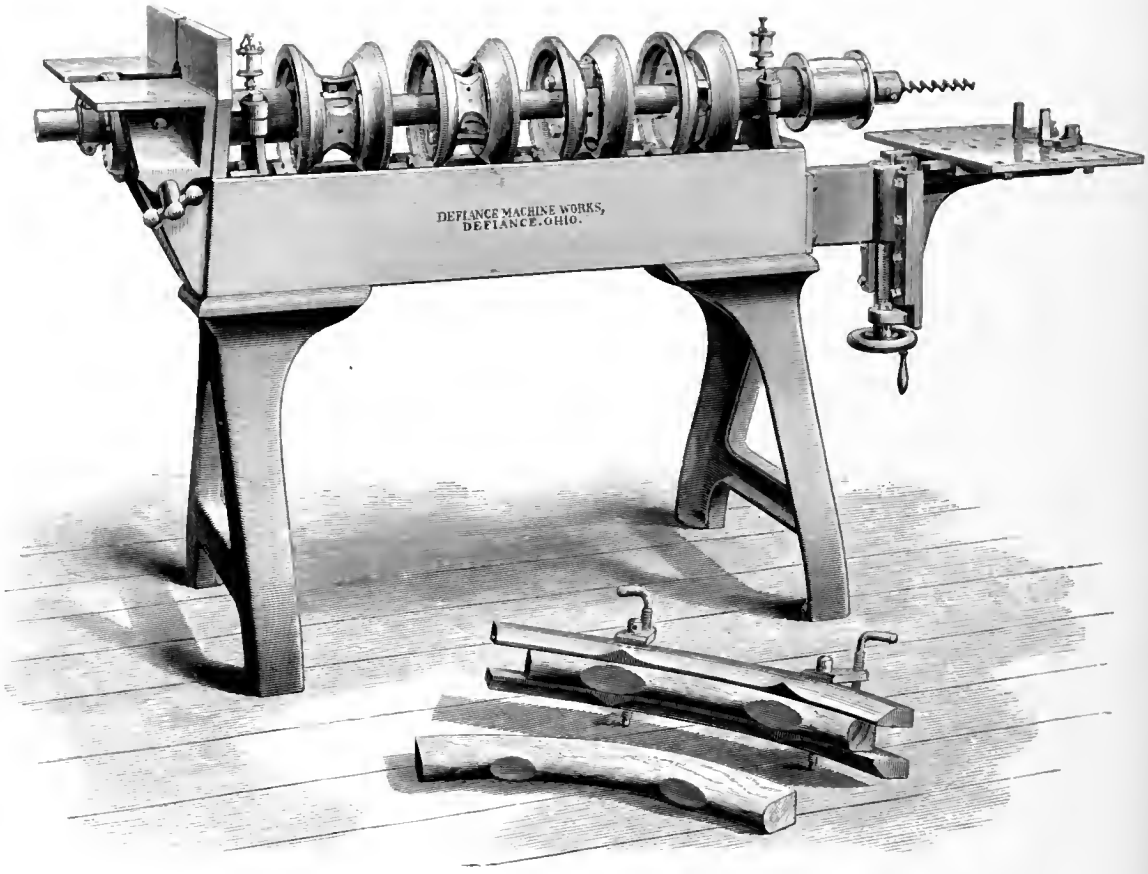
THE CIRCULAR guides, which surround the rounding heads, are very strong, and provided with a wide foot, which rests on the main frame of the machine in a planed tongue and groove to hold them firm and keep them in alignment. By loosening a single screw they can be adjusted to or from each other for regulating the depth of cut, and they are bored out on the inside true, so that the cutting edges of the knives can be set close up to the work; the outside circle of the guides upon which the material rests, while being operated upon, form a true angle of 90 degrees, to furnish a good bearing on each side when rounding or chamfering square material.

THE BUZZ PLANER HEAD is triangular in form, and carries three knives 6" wide, and they are fitted with chip breakers, and at each side of this head are adjustable iron tables, which measure 34" from end to end, and $6\frac{1}{2}$" wide. The beveling fence can be adjusted to any angle, or set square, while the machine is in motion. These tables can be set up or down independently for regulating the depth of cut. This attachment is most complete for planing and jointing material up to 6" wide and under.

BY ITS USE wagon and carriage poles and shafts can be planed and rounded all complete in the most satisfactory manner without leaving the operator's hands. The large variety of work that can be accomplished by this machine is innumerable, and it is the handiest and best general purpose machine that can be used in a wood-working factory.

THE COUNTER is furnished, as follows: Shaft, 36" long by $1\frac{11}{16}$" diameter; two No. 1 ball and socket hangers; driving pulley, 20" × 4"; tight and loose pulleys, 10" × 4"; speed, 760 rotations per minute; pulley on machine, 4" × 4"; speed, 3,800 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 36" × 60".



No. 2 Patent Rounding, Chamfering, and Cornering Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 50 Feet.

Cable Word, RUBY.

No. 2 Patent Rounding, Chamfering, and Cornering Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 50 Feet.

Cable Word, RUBY.

THE ENGRAVING represents an improved No. 2 Rounding, Chamfering, and Cornering Machine, with boring and buzz planer attachments, used by wagon, carriage, shaft, pole, felloe, gear, sleigh, agricultural implement, and other manufacturers in woodwork. It is intended to take the place of the upright shaping machine. It is more easily handled and not so dangerous to the operator.

THE BODY OF THE MACHINE, of iron, is cast in one piece, with cored center, and it is stiff and reliable throughout, rendering it capable of performing heavy work in a rapid manner without injury to the machine.

THE FOUR ROUNDER HEADS, as shown, are fitted with three knives each, with chip breakers, one of their number containing knives with straight faces, used for cutting straight chamfers; the balance are usually furnished with knives having semicircular cutting edges of different sizes, which cover a large variety of shapes for almost any class of rounding and cornering.

THE GUIDES, which surround the heads, are bored out true on the inside, so that the cutting edges of the knives can be set close up to the work. They are also turned true on the outside, including the bevel faces, which are made to 90 degrees' angle, so that square material to be rounded or chamfered will nest itself between the guides and have a true bearing on each side. The guides can be adjusted horizontally to or from each other by loosening a single screw to regulate the depth of cut.

THE SPINDLE, of hammered steel, $1\frac{15}{16}''$ diameter, runs in genuine babbitt metal, self-lubricating bearings, which are thoroughly inclosed to prevent the admittance of dust or dirt.

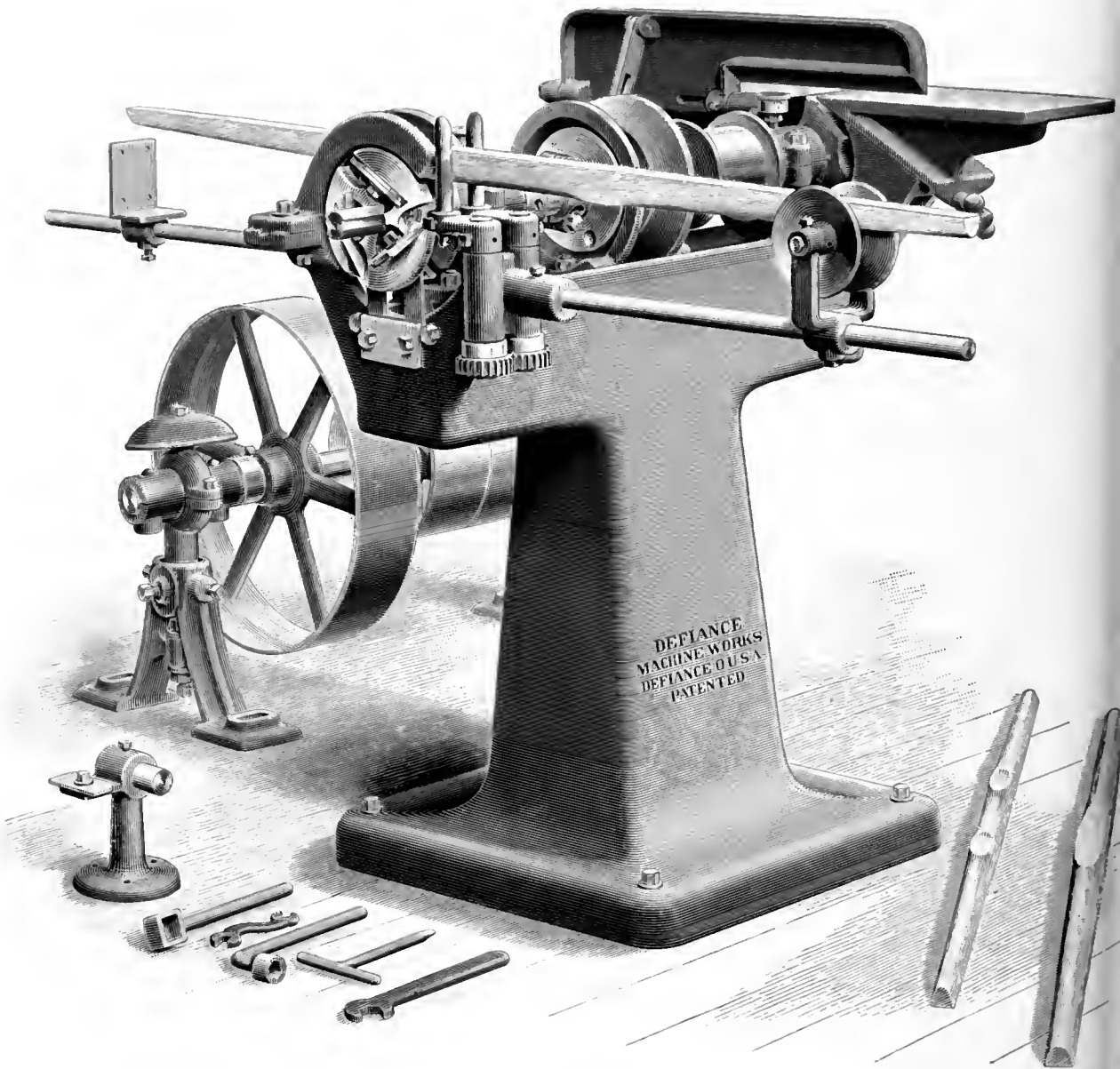
THE BUZZ PLANER HEAD is supplied on each side with an adjustable iron table, which is provided with hand wheel and screw to set them up or down for regulating the depth of cut. The table is fitted with a beveling fence same as used on the No. 1 machine for square or angular work. This head is supplied with three 6″ straight faced knives, for straight jointing and planing, or a set of knives with round faces, intended for rounding the sides of wagon poles, plow beams and handles, double-trees, etc., can be furnished.

THE BORING ATTACHMENT consists of a universal chuck fitted into the end of the main spindle, and it will open to receive boring tools with shanks up to ½″ diameter. The table upon which the stuff is placed while being bored is of iron, 12″ × 18″, and it is gibbed to the end of the main frame, and by means of a single screw it can be adjusted vertically for different thicknesses of material; when down it will bore in the center of material 8″ thick, having a 6″ horizontal sliding movement to and from the bit.

IT WILL shape, plane, and bore wagon poles, felloes, shafts, plow beams, and handles all complete, without leaving the operator's hands. It is the most useful machine that can be used in a wagon, carriage, or agricultural implement factory, and it is the only machine in the market that will do the work smooth without tearing.

THE COUNTER is furnished as follows; Shaft, 36″ × $1\frac{1}{16}''$; journals, $1\frac{7}{16}''$; two No. 1 hangers; driver, 20″ × 4″; tight and loose pulleys, 10″ × 4″; speed, 760 rotations per minute; pulley on cutter head spindle, 4″ × 4″; speed, 3,800 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 36″ × 72″.



No. 8 Patent Shaping, Cornering, and Planing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 950 Pounds.

Cubic Measurement, 45 Feet.

Cable Word, SYMPHONY.

No. 8 Patent Shaping, Cornering, and Planing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 950 Pounds.

Cubic Measurement, 45 Feet.

Cable Word, SYMPHONY.

THIS ENGRAVING represents our No. 8 Patent Shaping, Cornering, and Planing Machine, designed for a variety of uses, but more especially intended for the makers of wagons, carriages, sleighs, shafts, poles, and agricultural implements, to shape, round, corner, and plane regular or irregular shapes of wooden articles used in their construction.

THE FRAME of this machine is of neat design, cast in one piece, with cored center and a wide floor base of great strength, to properly support the working parts.

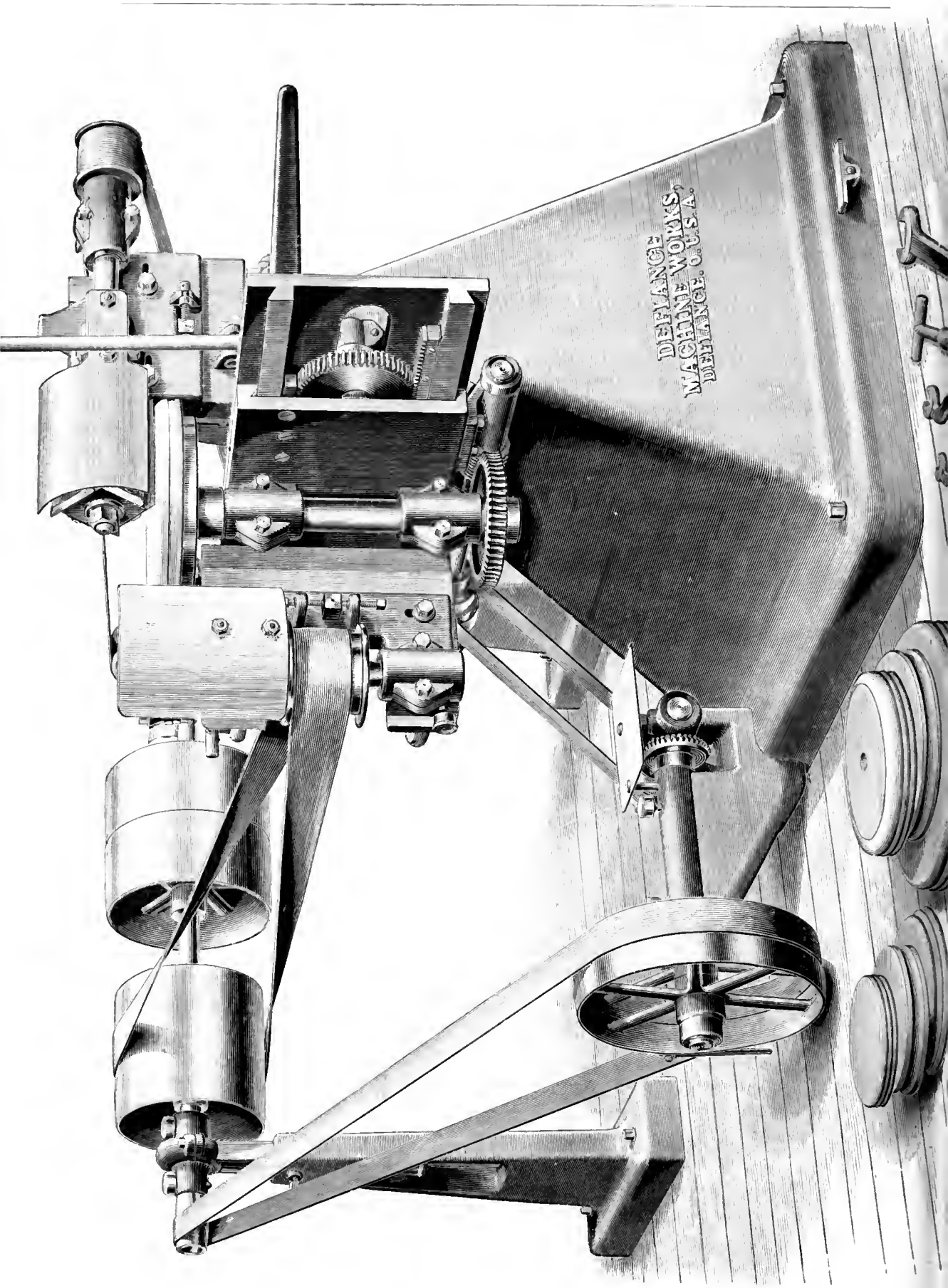
THE CUTTER HEAD SPINDLE, of forged steel, rotates in two heavy self-lubricating bearings, with one end fitted with a patent expanding bronze cutter head for shaping work to a semi-circle, such as buggy axle caps, whiffle-trees, single-trees, double-trees, etc., rounding the work clear over the full length or leaving flat spots. It is equipped with a novel self-centering device, which always centers the work accurately with the cutter heads, without any care on the part of the operator, and it is also provided with an adjustable stop gauge to gauge the position at which the cut shall begin when shaping axle caps and similar work that requires flat spots. When desired an extra axle cap shaping device may be substituted for the buzz planer attachment.

THE CORNERING HEAD in the center of the spindle is used for doing all kinds of rounding, chamfering, and cornering. It is constructed of two flanges, with three knives and chip breakers clamped between them. Knives of different widths can be used either with round or straight cutting edges to suit the nature of the work to be accomplished. This head is surrounded by two adjustable guide rings that are turned on the face and bored out true, so that the work will have a true bearing when placed upon them, and the cutters can be set close up to the guides. They are adjustable horizontally on the frame, by loosening a single bolt to govern the depth of cut.

THE PLANER HEAD is of the three-wing type, carrying three knives with 6″ faces, and provided with an adjustable table on either side, which can be quickly set up or down by hand screw, to regulate the depth of cut, and they are fitted with an adjustable fence which can be set square with the tables for square work, or to any angle required for bevel planing. The fence and tables are accurately planed and fitted so that correct work can be accomplished with it.

THE COUNTER is furnished as follows: Shaft, 36″ long, $1\frac{11}{16}$″ diameter; two No. 1 ball and socket adjustable drop hangers, fitted with an improved belt shipping apparatus; one driving pulley, 20″ × 4″; the tight and loose pulleys are 10″ × 4″; speed, 760 turns per minute; the pulley on the cutter head spindle is 4″ × 4″; speed, 3,800 turns per minute.

HORSE POWER to drive, 2; floor space occupied, 60″ × 72″.


DEFIANCE
MACHINE WORKS,
DEFIANCE, O. U.S.A.

No. 1 Automatic Variety Shaping Machine.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,300 Pounds.

Cubic Measurement, 126 Feet.

Cable Word, SENOSEE.

THIS ENGRAVING represents our No. 1 Automatic Variety Shaping Machine, especially designed for rapidly and accurately shaping stool seats, circular discs, tackle block sheaves, and many other similar articles, from either hard or soft wood. It is capable of receiving the rough material after it has been sawed to a circle and shape the top complete, smooth, and true, straight over, tapering, convex, or coneave, and dress the edges to any shape desired, at a speed equal to about six experienced hand turners, with capacity sufficient to handle from 4″ up to 16″ diameter, different thicknesses.

IT IS the first successful attempt to manufacture articles as described above, by a rapid process and do smooth and perfect work. Even by the slow method of hand turning it is difficult to turn the wood smooth, because it is necessary to work with and against the grain of the material; but with this new machine, even the hardest cross-grained stock can be successfully dressed to a smooth and true surface, and each piece of a kind will be made to an exact duplicate, which is another important feature.

THIS MACHINE is constructed on a heavy iron frame, cast in one piece, with a cored center and a broad floor base to stand firm. It is of sufficient strength to withstand the heaviest labor, entirely free from jar or vibration, which is very essential to secure smooth work. All the working parts are accurately fitted, the wearing surfaces are scraped to bearing, and the gears and racks are cut from the solid.

THE HORIZONTAL SHAPING HEAD, which dresses the top of the work, carries four shear-cutting knives, and it is fitted to a heavy steel spindle which runs in large, self-lubricating bearings. The saddles supporting the bearings are gibbed to an upright column forming a part of the main frame of the machine. A convenient hand lever is connected with the saddle to quickly bring the cutter head down to the work, or raise it up out of the way when not in use. A stop gauge is provided which regulates the exact depth of cut, and the cutter head spindle can be adjusted horizontally with the work, or at an angle in either direction.

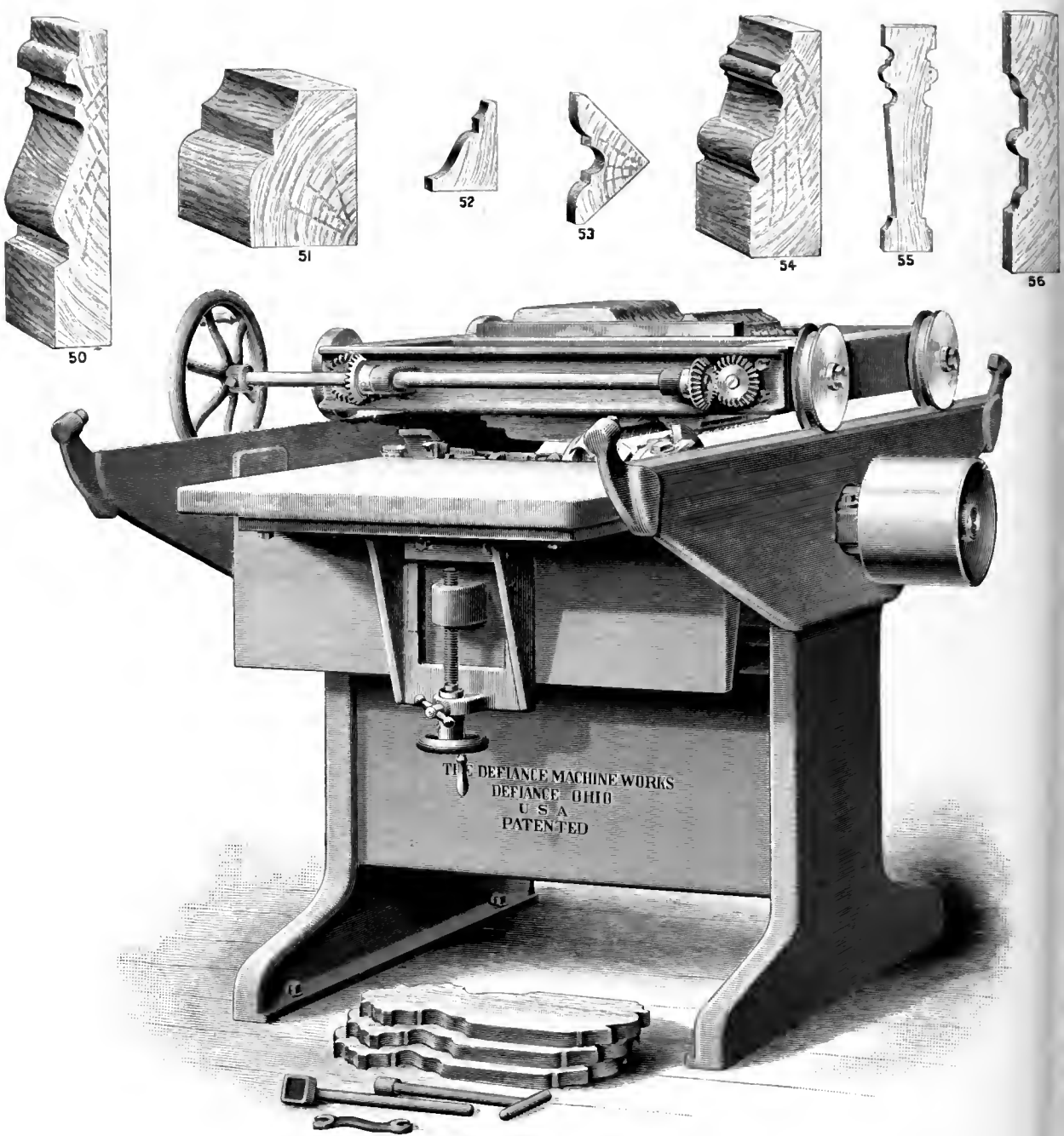
THE VERTICAL MOULDING HEAD is of novel design and carries eight cutters with the cutting edges shaped to suit the work desired. It is fitted to a large steel spindle running in long, self-oiling bearings which are fitted to a heavy casting which is gibbed to the main frame, and it can be instantly adjusted horizontally to or from the work to regulate the diameter of the finished product. It also has a vertical adjustment to center the cutters with the work. When once set for a certain diameter of turning no further adjustment is required.

THE SPINDLE CARRYING THE WORK stands vertical. The upper end is fitted with a screw face-plate, the lower end with worm gearing to drive the feed, which is provided with three changes of speed for small and large work. This spindle is also fitted into heavy bearings which are a part of the large saddle which is gibbed to the main frame of the machine and is connected by a convenient hand lever operating a cut gear and rack for moving the work to and from the cutters.

IN OPERATING THIS MACHINE the spindle carrying the work is moved back towards the operator out of harm's way, with the horizontal shaping head raised up. The rough block to be shaped is then clamped to the face-plate, after which it is moved to the moulding head to a point where an adjusting stop is reached which regulates the diameter of the work; after which the horizontal shaping head is brought down to its work, and the article is finished, complete, in one or two rotations. So quickly is the operation performed that between 500 and 600 heavy pieces can be completed in ten hours.

THE COUNTER is independent of the machine. It should be placed a convenient distance away to secure the proper length of belts. It consists of the following parts: One countershaft, $1\frac{15}{16}$″×62″; two 37″ floor stands with belt shipping apparatus attached; one drive pulley, 12″×11″ face; one drive pulley, 13″×3½″ face; one drive pulley for feed, 2½″×4½″ face; tight and loose pulleys, 12″×6″; speed, 800 turns per minute.

HORSE POWER to drive, 4; floor space occupied, 60″ × 108″.



Patent Transverse Moulding Machine.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 100 Feet.

Cable Word, MUSK.

Patent Transverse Moulding Machine.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 100 Feet.

Cable Word, MUSK.

THIS ENGRAVING represents a new Transverse Moulding Machine designed for cutting mouldings upon the edge of short boards, corner blocks, etc., as shown by the accompanying engravings representing samples of work.

THIS MACHINE is used by the manufacturers of furniture, desks, sewing machine woodwork, pianos, organs, etc., where a large number of duplicate parts of this kind are required. Previous to its introduction this work was performed upon scroll or band saws; it being a slow process and requiring the marking out of work before sawing and the finishing by hand to remove the saw marks before completion.

ALL THIS is now accomplished by the use of the Transverse Moulder so smooth that no hand labor is required, and 100,000 pieces can be made to exact size and shape, and laying off the work is avoided, with a capacity equal to that of twenty scroll saws.

THE FRAME is a heavy casting with cored center, having a broad floor support; the top forms two parallel tracks which are accurately planed and upon which the carriage travels.

THE TRAVELING CARRIAGE is fitted with a sliding jaw, forming a large chuck which accurately clamps and holds the material in position while being operated upon.

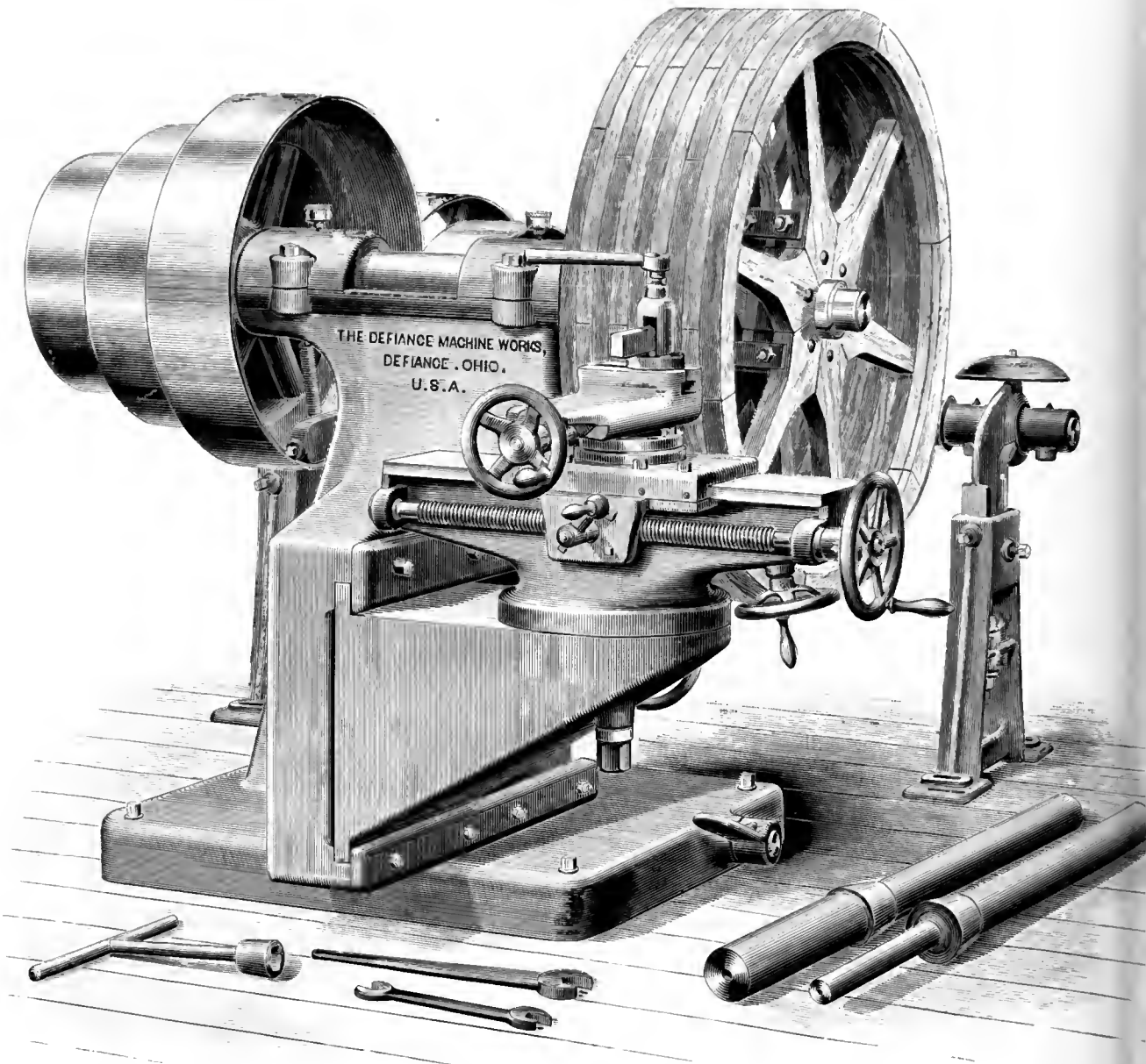
THE CUTTER HEADS are fitted to a 2¼″ steel spindle, which is located in the center of the main frame underneath the traveling carriage, and the heads are supplied with knives of the shape desired to cut; a table, having a vertical adjustment by hand wheel and screw, is located immediately in front of the cutters for securing alignment to the work to be gripped by the chuck and gauge the depth of cut.

IN OPERATION the carriage is first moved over the table, and the stock to be planed is placed between the jaws of the carriage, and rests upon the table; the jaws are then closed and the material clamped into position by turning the hand-wheel attached to the carriage; the carriage with its contents is then moved over the cutter heads by hand and the work completed; when the end of cut is reached the jaws are released and the entire contents of the chuck are discharged. The chuck when wide open measures 24″ long × 25″ wide, and it is capable of receiving 24 boards 1″ thick, 25″ long, all of which can be operated upon at one time; other pieces of different sizes and shapes can be worked in proportion.

THIS MACHINE is built in special large sizes to order, with heads and knives for cutting almost any class of edge moulding.

THE COUNTER is furnished as follows: Shaft, 48″ long, $2\frac{3}{16}$″ diameter; journals, $1\frac{11}{16}$″ diameter; two No. 2 ball and socket hangers; driver, 30″ × 6″; tight and loose pulleys, 14″ × 6″; speed, 600 rotations per minute; pulley on machine, 8″ × 6″; speed, 2,250 rotations per minute.

HORSE POWER to drive, 3; floor space occupied, 54″ × 72″.



48″ Universal Wood Pulley Turning and Finishing Machine.

Export Shipping Weight, 3,100 Pounds.

Net Weight, 2,600 Pounds.

Cubic Measurement, 87 Feet.

Cable Word, LATTY.

48″ Universal Wood Pulley Turning and Finishing Machine.

Export Shipping Weight, 3,100 Pounds.

Net Weight, 2,600 Pounds.

Cubic Measurement, 87 Feet.

Cable Word, LATTY.

THE ACCOMPANYING ENGRAVING represents an improved Universal Wood Turning Lathe, designed especially for the makers of wood pulleys, and it possesses every convenience of operation that may be desired for dressing the face, turning the edges, truing the inner circle, and finishing complete the several operations required in wood pulley making, and it is unusually well adapted for rapid and accurate work.

IT IS EXTRA HEAVY, care having been taken to secure in every way a stiff and reliable machine, one that will run with absolute steadiness, and produce its work smooth and true, free from jar or chatter.

ITS CAPACITY is sufficient to swing a pulley up to 48″ in diameter, 24″ face, and all sizes under, and it will do the work within these sizes more perfectly and at an immense saving over any other machine.

THE FRAME is cast in one piece, with cored center, with broad base, and of sufficient weight to stand firm even without fastening to the floor.

THE MAIN SPINDLE is 4½″ diameter, and it runs in genuine babbitt metal bearings, supplied with self-lubricating cups, having a three-step cone pulley for 6″ belt attached to the rear end.

THE MANDREL, upon which the pulley to be turned is placed, is fitted to the main spindle into a reamed taper hole extending entirely through the spindle, and it is locked firmly in position by a screw at the rear end, the opposite end overhanging the frame for convenience in placing the work in and taking it from the machine.

THE KNEE which supports the slide rest is cast with cored center, and is gibbed to the main frame, having a horizontal adjustment by hand wheel and screw, for work of different diameters.

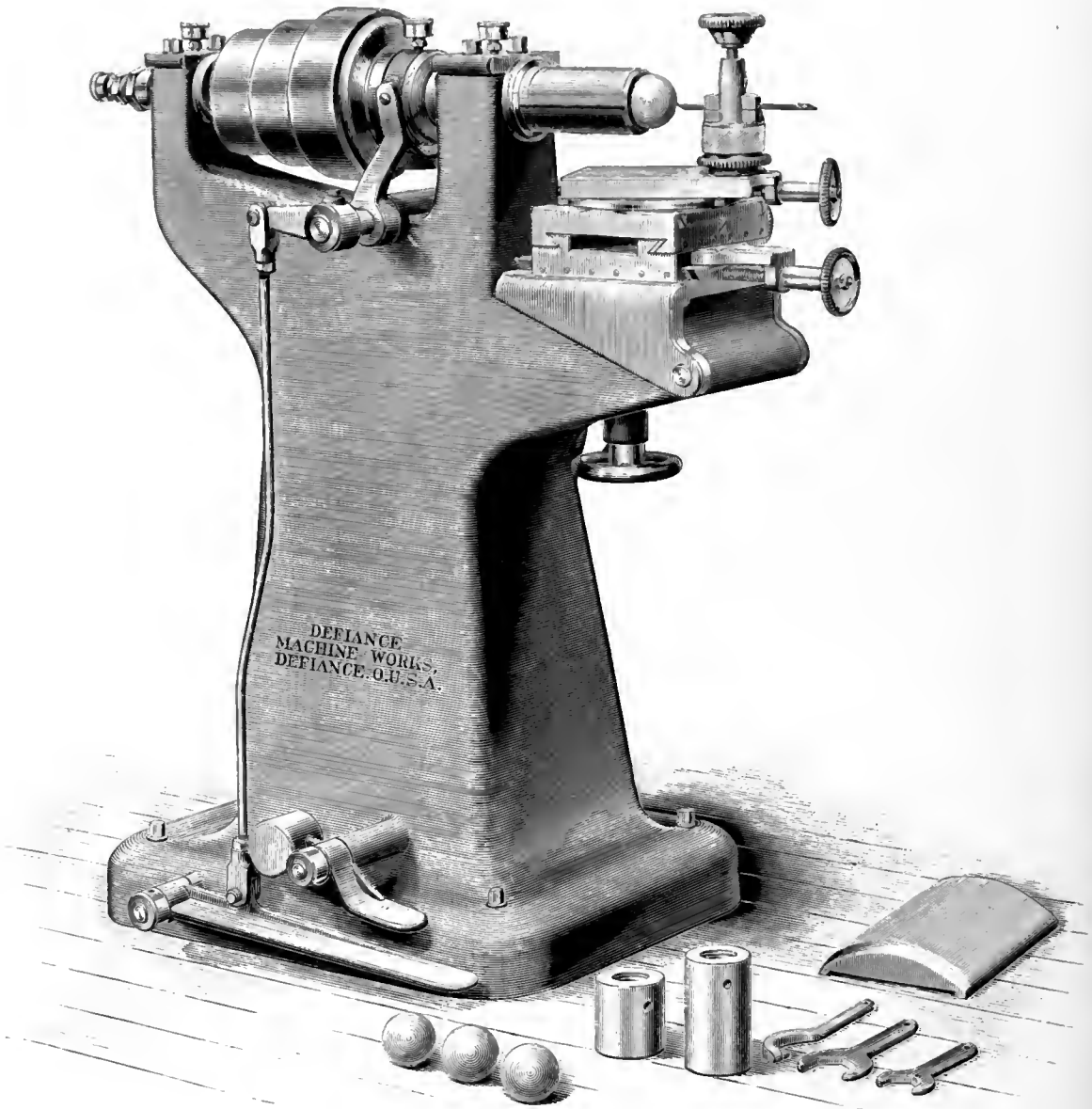
THE SLIDE REST is mounted upon the knee, nicely fitted to it, and pivoted upon a heavy center stud, and it can be set parallel with the spindle, or at any angle for turning straight or crowning, and with a single screw can be locked in any position.

THE TOOL REST is accurately scraped and fitted with a taper gib; it can be adjusted to any position with the spindle.

THE OPERATOR has complete control over the machine from the working side. The foot treadle at the base operates a friction brake, which is brought to bear against the inner side of the cone pulley to stop the machine promptly.

THE COUNTER: Shaft, $2\frac{3}{16}'' \times 5$ feet 6″; three $2\frac{3}{16}''$ slip collars; iron cone pulley, $29\frac{3}{4}''$, $26\frac{3}{16}''$ and $21\frac{15}{16}'' \times 6''$ face; tight and loose pulleys, $16'' \times 8''$; speed, 500 rotations per minute; cone pulley on spindle, $24\frac{1}{16}''$, $19\frac{15}{16}''$, and $15\frac{7}{8}'' \times 6''$ face.

HORSE POWER to drive, 3; floor space occupied, $54'' \times 70''$.



No. 1 Improved Ball Turning Lathe.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,100 Pounds.

Cubic Measurement, 35 Feet.

Cable Word, LACE.

No. 1 Improved Ball Turning Lathe.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,100 Pounds.

Cubic Measurement, 35 Feet.

Cable Word, LACE.

THIS ENGRAVING represents our No. 1 Improved Ball Turning Lathe, especially designed for turning and polishing composition billiard and pool balls. It can also be used to bore the balls and press in the plugs for color work and numbering them. When so ordered it can be furnished with attachments for turning and finishing balls from ivory, wood, and other materials.

THIS MACHINE is fitted in every detail with the greatest care, and with it a perfectly true ball can be produced with an inexpensive operator to handle it. The many convenient features embodied in its construction largely increase the capacity and improve the quality of work over machines heretofore used.

THE FRAME is heavy and substantial, of neat design, cast in one piece, with cored center and a broad floor base to stand firm.

THE HEAD SPINDLE, of steel, large in diameter, is accurately ground to size and fitted into long bronze self-lubricating bearings arranged to take up for wear. It is driven by a three-step friction cone pulley fitted with bronze bearings running loose upon the spindle, which engages with a friction disc feathered to the spindle, having a slight horizontal movement on the shaft to and from the cone pulley. A foot pedal with necessary connections is used for engaging the frictions. A slight pressure of the operator's foot upon the lower pedal immediately starts the friction, which continues to run until the foot of the operator is applied to the upper pedal, when the frictions are immediately disengaged and an automatic brake is applied, instantly stopping the machine. By this arrangement the operator has complete control over the machine from the working side, starting and stopping the same instantly without shifting a belt or changing his position.

THE COMPOUND TOOL REST is provided with every desired adjustment horizontally with the spindle for regulating the diameter of turning; also, a right angular adjustment to center the tool with the work, and a rotary swinging movement to secure the circle of the turning. The tool post has a vertical adjustment to bring the cutting edge of the tool central with the work. All the various bearings are accurately scraped to fit, and provided with gibs to take up for wear. All screws run in split bronze nuts to take up the slightest variation that may occur. The tool rest is hinged to the frame and can be swung down out of the way when using the machine for polishing. The shield shown on the floor is then placed over the finished surface of the table to protect it.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 42''$; tight and loose pulleys, $10'' \times 5''$; cone pulley, $18'' \times 3''$, $17'' \times 3''$, $16'' \times 3\frac{1}{4}''$; two No. 2 ball and socket adjustable hangers fitted with rack and pinion belt shipper; speed of countershaft, 1,000 turns per minute.

HORSE POWER to drive, 1; floor space occupied, $26'' \times 43''$.

No. 1 Patent Automatic Oval Wood Dish Machine

No. 1 Patent Automatic Oval Wood Dish Machine.

Export Shipping Weight, 3,500 Pounds.

Net Weight, 2,700 Pounds.

Cubic Measurement, 150 Feet.

Cable Word, DELMONICO.

THIS ENGRAVING represents our No. 1 Patent Automatic Oval Wood Dish Machine, which has been designed especially for cutting wood dishes, or plates, from the face of a block of wood.

ITS CAPACITY is sufficient to make 75,000 dishes per day of ten hours, cutting about 25 to the inch. They are generally made in four sizes, as follows: No. 1, $7\frac{1}{2}'' \times 5\frac{3}{4}''$; No. 2, $6\frac{1}{4}'' \times 8''$; No. 3, $6\frac{3}{4}'' \times 9''$; No. 5, $7\frac{1}{4}'' \times 9\frac{1}{2}''$; although different sizes can be produced by the use of a special sized cutter. The blocks of wood used should be $\frac{1}{2}''$ larger than the dish to be cut, up to 24" in length and shorter.

THE OVAL WOOD DISHES are exceedingly fine and inexpensive receptacles for holding butter, lard, cheese, berries, pickles, etc. They are perfectly clean, which, together with the neatness and convenience of the package, has caused them to be generally adopted in America by all grocerymen and others dealing in the articles named. These dishes can also be used for many other purposes.

THIS MACHINE is entirely automatic in its movements and exceedingly simple in all its parts. It can be handled successfully by cheap labor.

THE FRAME is a massive casting in one piece with cored center and a broad floor base, with the working parts accurately fitted to it.

THE KNIVES employed consist of a revolving circular cutter for cutting the dish by a single continuous cut, and a facing knife for shaving off the surface of the block between each cut of the dish knife, for making the dish to uniform size and with straight edges.

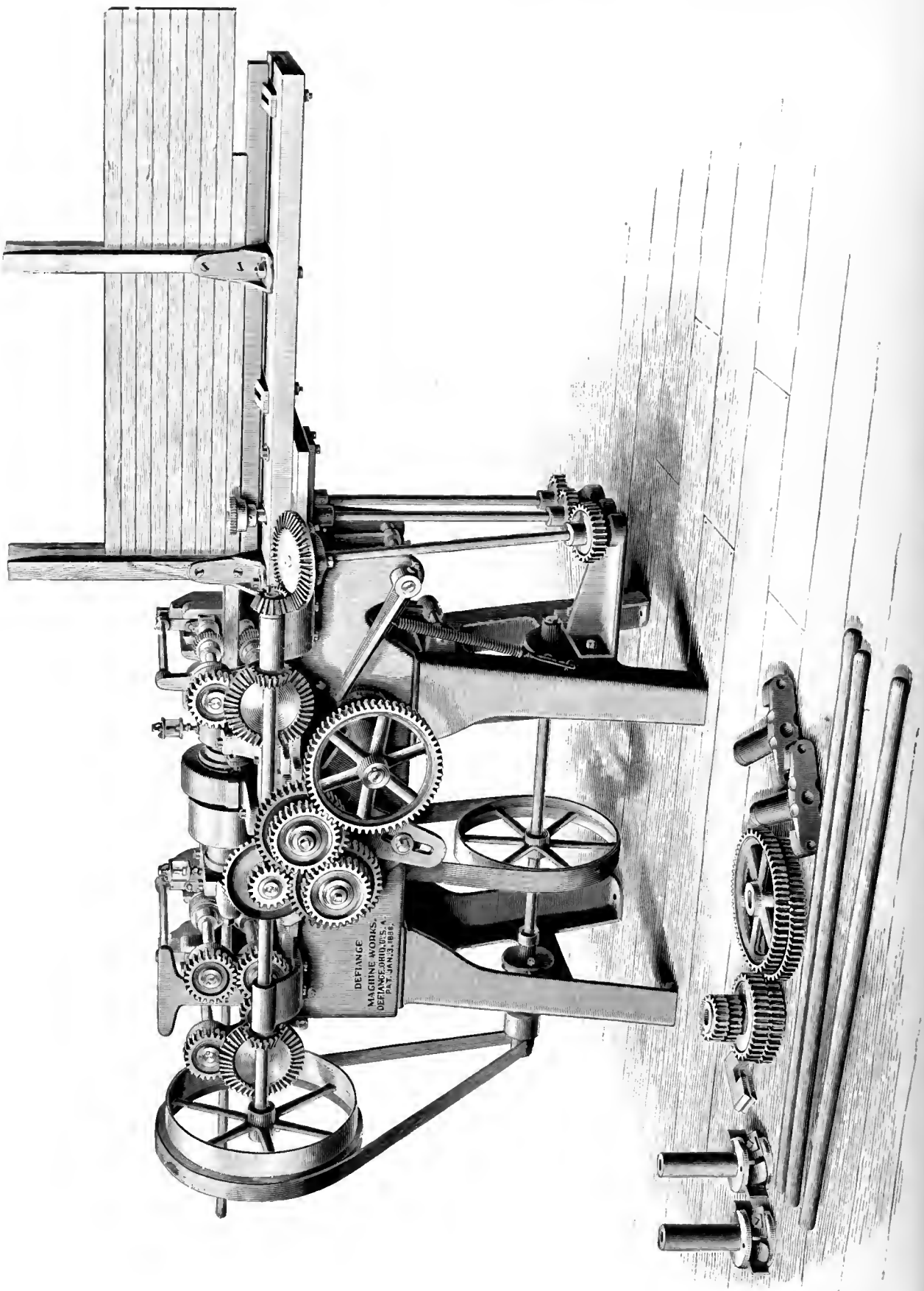
THE CARRIAGE which supports the wood block is thoroughly gibbed to the main frame and fitted with a powerful chuck or jaw for gripping and securely holding the block while being operated upon. It is opened and closed by hand wheel and screw to receive blocks of different sizes. A screw fitted through the frame connects with the carriage to a quick opening and closing nut to engage or disengage the feed. When the nut is opened the carriage can be moved horizontally in either direction by rack and pinion motion, which is used for saving time in moving the carriage forward when commencing a cut, or moving the carriage back after the last dish has been cut ready for the next block.

THE SCREW FEED is driven by cut gears and is automatic. After the block has been placed into the chuck or jaw the carriage is fed forward by hand-wheel to where the cutting shall begin, when the nut is engaged with the screw by a convenient hand lever. Instantly the block is fed forward, when each revolution of the cutters produces a dish, and so continuing until the block is entirely consumed. When the last dish is cut the nut is automatically opened and the feed arrested, at which time the operator is free to move the carriage back ready for the next block. The feed can be adjusted to cut dishes of different thicknesses, and it can be stopped at any point while the machine is in motion by simply lifting the feed pawl.

THE MATERIAL used from which dishes are made is usually maple, but any wood can be used that is odorless and of sufficient strength to answer the purpose. The material is simply sawed into blocks of the desired dimensions to produce the proper sized dish. They should be boiled in hot water to soften them before going to the machine.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 44''$; two No. 2 hangers; tight and loose pulleys, $12'' \times 6''$; driving pulley, $12'' \times 5''$; speed, 550 revolutions per minute; friction pulley on machine, $12'' \times 5''$; speed, 550 revolutions per minute.

HORSE POWER to drive, 2; floor space occupied, $52'' \times 82''$.



The Chaplin Patent Automatic Handle Lathe.

The Chaplin Patent Automatic Handle Lathe.

Export Shipping Weight, 1,900 Pounds.
Net Weight, 1,400 Pounds.
Cubic Measurement, 67 Feet.
Cable Word, LAURA.

THIS ENGRAVING represents the Chaplin Patent Automatic Handle Lathe, used for rapidly and accurately making broom, rake, fork, hoe, and other round handles, including stems for D Handles as well as curtain and pike poles, flag poles, fishing rods, billiard cues, Vienna bent chair backs, and various other wooden articles, either straight or tapering, making a straight taper full length, or taper and straight on the same piece, or for turning swell work.

IT IS the first successful attempt at producing an automatic turning lathe for this class of work. It will turn from ¼″ diameter up to $1\frac{13}{16}$″ diameter, and from 30″ long up to any length, having a hollow spindle through which the material to be turned is fed, and not depending upon centers to hold the work as by the old class of turning lathes. Material 60 feet long can be turned if desired.

ITS CAPACITY is sufficient to turn about 8,000 broom handles in ten hours, either from hard or soft wood, and produce smooth and true work, making pieces of one kind to exact size and shape.

THE FRAME, of iron, is heavy and substantial with a broad floor base, with the working parts, including a suitable table for the support of the material, mounted upon it.

THE CUTTER HEAD SPINDLE, of large diameter, runs in long bearings, and it is equipped with two cutter heads; the first, a roughing head which reduces the handle square to the smallest diameter at which it will finish, leaving a small surplus for the second or finishing head, which is located behind the rougher. The finishing head contains expanding knives which are opened and closed by the aid of a cam driven by cut gearing for turning taper or swell work, requiring a cam for each different design or shape of handle. The cams and gears are numbered for different classes of work, and, by following the chart which we furnish, the machine can be quickly adjusted from one class of work to another.

THE FEED is driven by cut gearing and it is very powerful, with two changes of speed for small and large work. Eight feed rollers are employed, four in front and four behind the cutters, to feed the material in and out of the machine. The two vertical rollers located at the table automatically receive the material from the table and feed it forward to the V shaped horizontal rollers which carry it through the cutter heads and clear of the machine.

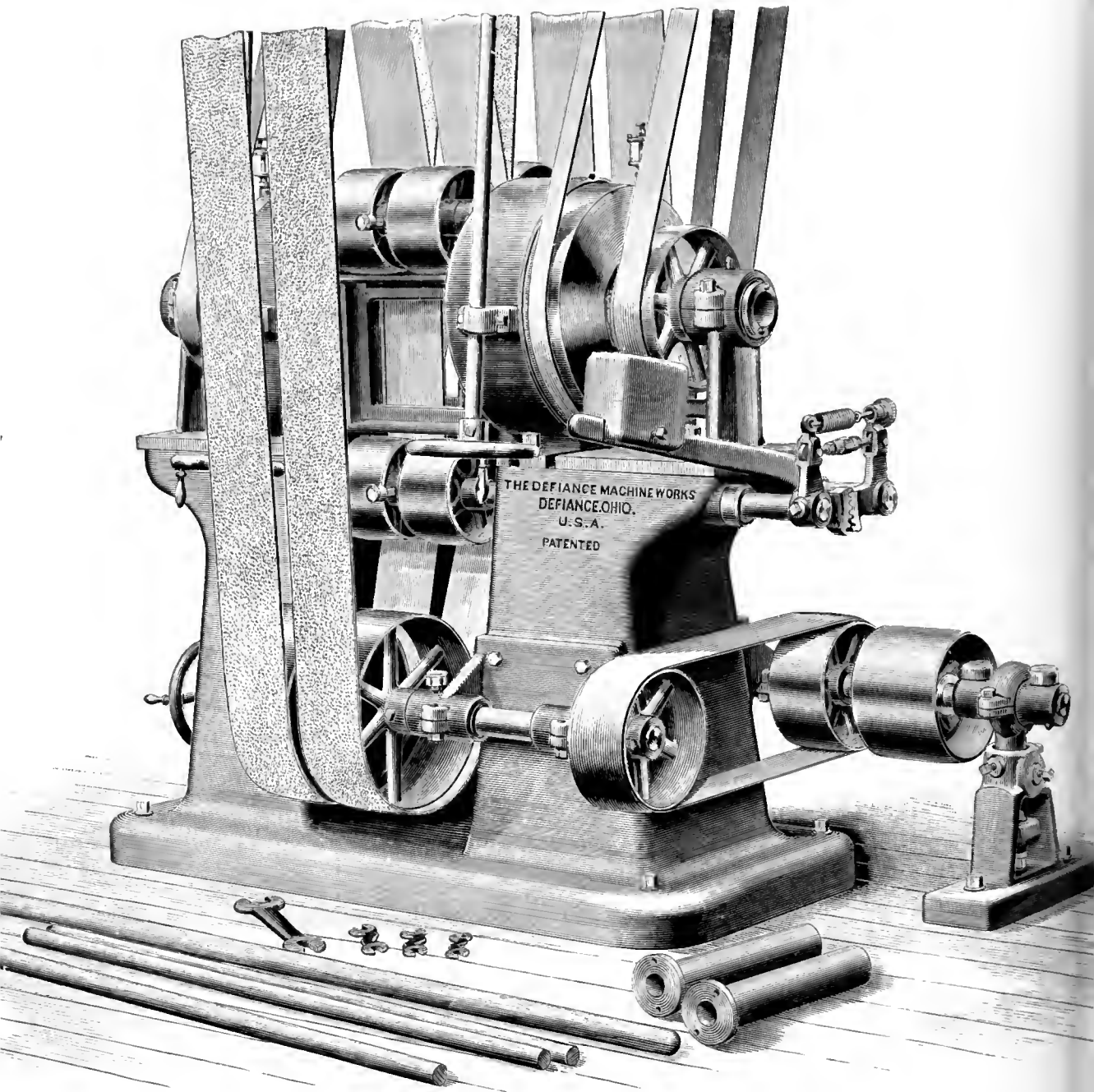
THE MATERIAL to be turned is placed into the rack on the table, which is capable of holding a number of pieces at one time, and the vertical feed rollers open and close automatically at the proper time to receive and feed forward the bottom piece, which when fed through allows the next piece to take its place upon the table, when the feed rollers again close in and repeat the operation, and so continue, keeping the machine constantly supplied with work.

ALL THE MOVEMENTS are automatic. It is simply necessary for the operator to place the stock to be turned into the rack and the finished product is discharged at the rear of the machine.

PREVIOUS TO ITS INTRODUCTION the material was handled twice, first to place it between the centers, and second to remove it when finished. The entire work is now accomplished by the use of this automatic machine at one and the same time; ten times more rapidly, much more smoothly, and more uniformly turned. It is an indispensable machine to manufacturers in this line.

THE COUNTER is furnished as follows: Shaft $1\frac{15}{16}$″ × 48″ long; two No. 2 ball and socket adjustable hangers; driving pulley, 30″ × 4″; tight and loose pulleys, 14″ × 5″; speed, 700 rotations per minute.

HORSE POWER to drive, 4; floor space occupied, 45″ × 96″.



No. 2 Patent Automatic Handle Polishing Machine.

Export Shipping Weight, 3,400 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, PIANO.

No. 2 Patent Automatic Handle Polishing Machine.

Export Shipping Weight, 3,400 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, PIANO.

THIS ENGRAVING represents our No. 2 Patent Automatic Handle Polishing Machine, which is used for rapidly and accurately polishing broom, rake, fork, hoe, and other round handles, curtain poles, pike poles, and other round turned work, from ½″ up to 2″ diameter, and from 24″ up to any length.

THE FRAME, of neat design, is heavy and well proportioned. It is cast in one piece with cored center and a broad floor base to stand firm, overcoming jar or vibration.

THE FEEDING MECHANISM is an ingenious device. It receives the handles to be polished, rotates and feeds them forward between the polishing belts at a speed sufficient to finish about 10,000 handles 42″ long in ten hours, and other lengths in proportion. All the gears are cut to insure a steady motion to the feed, and they, with their working parts, are thoroughly inclosed in iron cases to exclude dust or dirt.

THE FOUR POLISHING BELTS are flexible and stand vertically, two on each side of the work to be polished. They are 5″ wide and provided with strainers to keep them to the proper tension. This adjustment is secured by two convenient hand-wheels, shown on either side of the polishing belts. They can also be instantly adjusted to or from each other for small or large work and to secure the proper contact with the work. These several adjustments are made while the machine is in motion.

ITS ADVANTAGES over other machines for this work are many. The four polishing belts are of extra length, running from the machine to a counter attached to the ceiling, which secures a large amount of wearing surface. The first two belts are covered with rather a coarse polishing material, and the other two immediately behind them with a very fine sand, so that handles which are imperfectly turned can be fed through the machine and made true and smooth. Operators of handle-turning lathes do not always keep their machines in proper condition to do smooth work, consequently with this new polisher such handles are converted into No. 1 stock. On the other hand, for smoothly turned work the first two belts should be provided with fine sand and the other two with wax, so that the polishing and waxing can be accomplished at one pass of the work through the machine. All belts can be placed on or off the machine without disconnecting any of the parts.

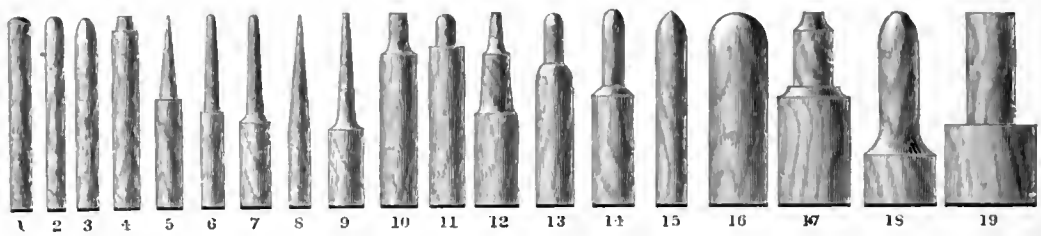
ALL THE WEARING SURFACES are fitted with the greatest care. All the journal boxes are lined with genuine babbitt metal and equipped with self-oiling, dust-proof cups. The loose pulleys are fitted with bronze bearings and self-oiling devices.

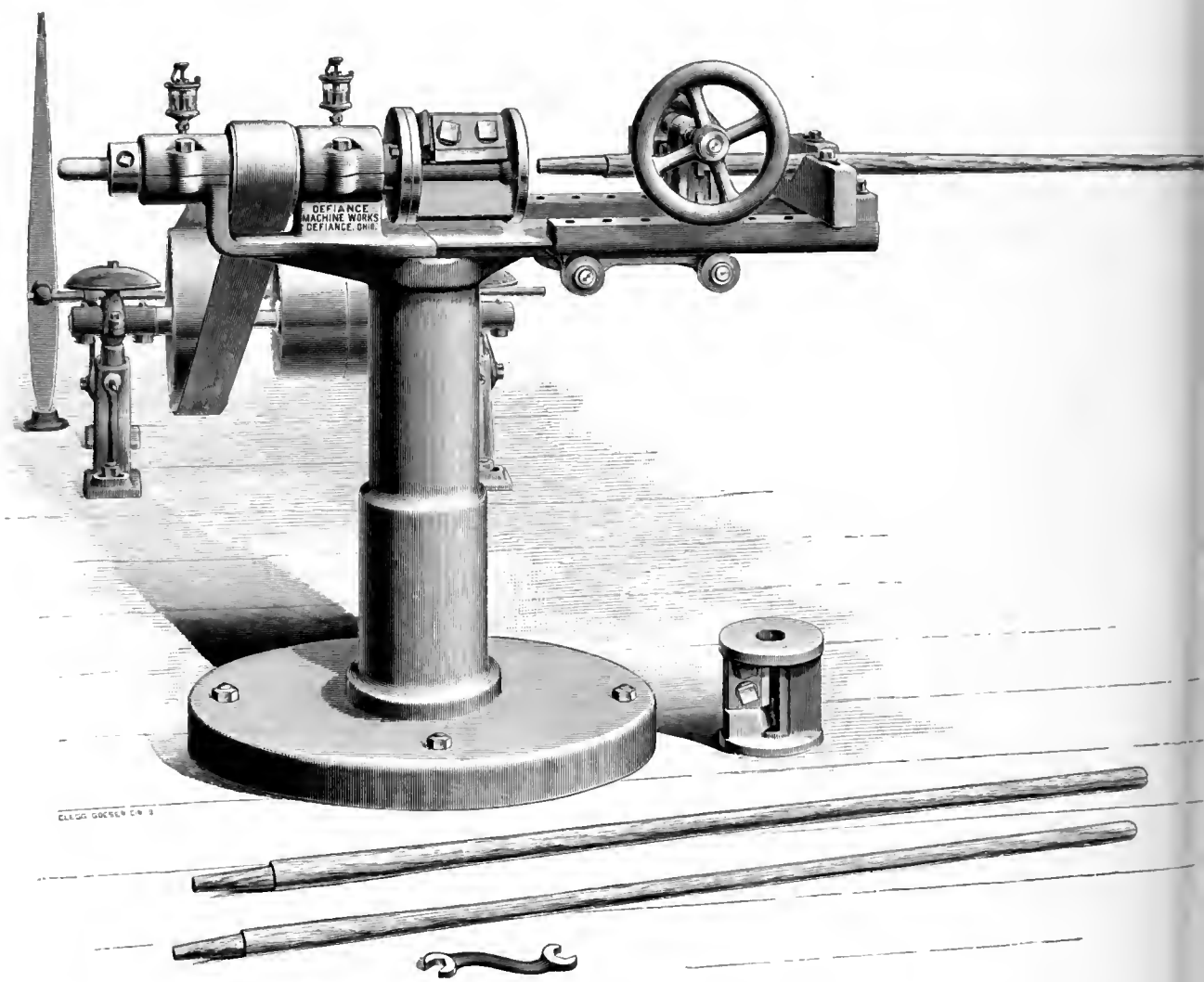
THIS MACHINE can be handled successfully by unskilled labor, as it is entirely automatic in its movements. The work to be polished is simply fed into the machine, the feeding rolls carrying it between the polishing belts and clear of the machine, as live rolls are used on both sides of the belts, consequently a continuous line of work can be kept going through the machine and the work produced by it will be of a superior quality.

IN ORDERING give the height of the ceiling of the room in which this machine is to be used, and also state the diameter of the work to be polished.

THE COUNTER is furnished as follows: Shaft, $1\frac{5}{16}'' \times 72''$; two No. 2 ball and socket adjustable drop hangers; one driving pulley, $26'' \times 6''$; tight and loose pulleys, $14'' \times 6''$; two pulleys, $5\frac{1}{4}'' \times 3''$, for driving the loose gears; two pulleys, $4'' \times 3''$, for revolving the feed heads; one floor stand, 12″ high; speed of tight and loose pulleys, 450 turns per minute.

HORSE POWER to drive, 5; floor space occupied, $34'' \times 90''$.





No. 1 Improved Chucking and Tenoning Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 22 Feet.

Cable Word, CLEVELAND.

No. 1 Improved Chucking and Tenoning Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 22 Feet.

Cable Word, CLEVELAND.

THIS ENGRAVING represents a very comprehensive Chucking and Tenoning Machine designed to answer for a much larger range of uses than ordinary machines of this type, and it is recommended for cutting round tenons from $\frac{1}{8}''$ up to 3″ diameter any length, either parallel or tapering, with square, beveling, or round shoulders, or for rounding the ends of handles, etc., as shown by the engravings representing samples of work as produced by the machine.

THE SPINDLE is of large diameter and fitted with a $1\frac{3}{16}''$ hole extending through it, which permits tenons of any length to pass through the head. A suitable adjustable gauge is fitted into the hole through the spindle, for the purpose of gauging the length of cut.

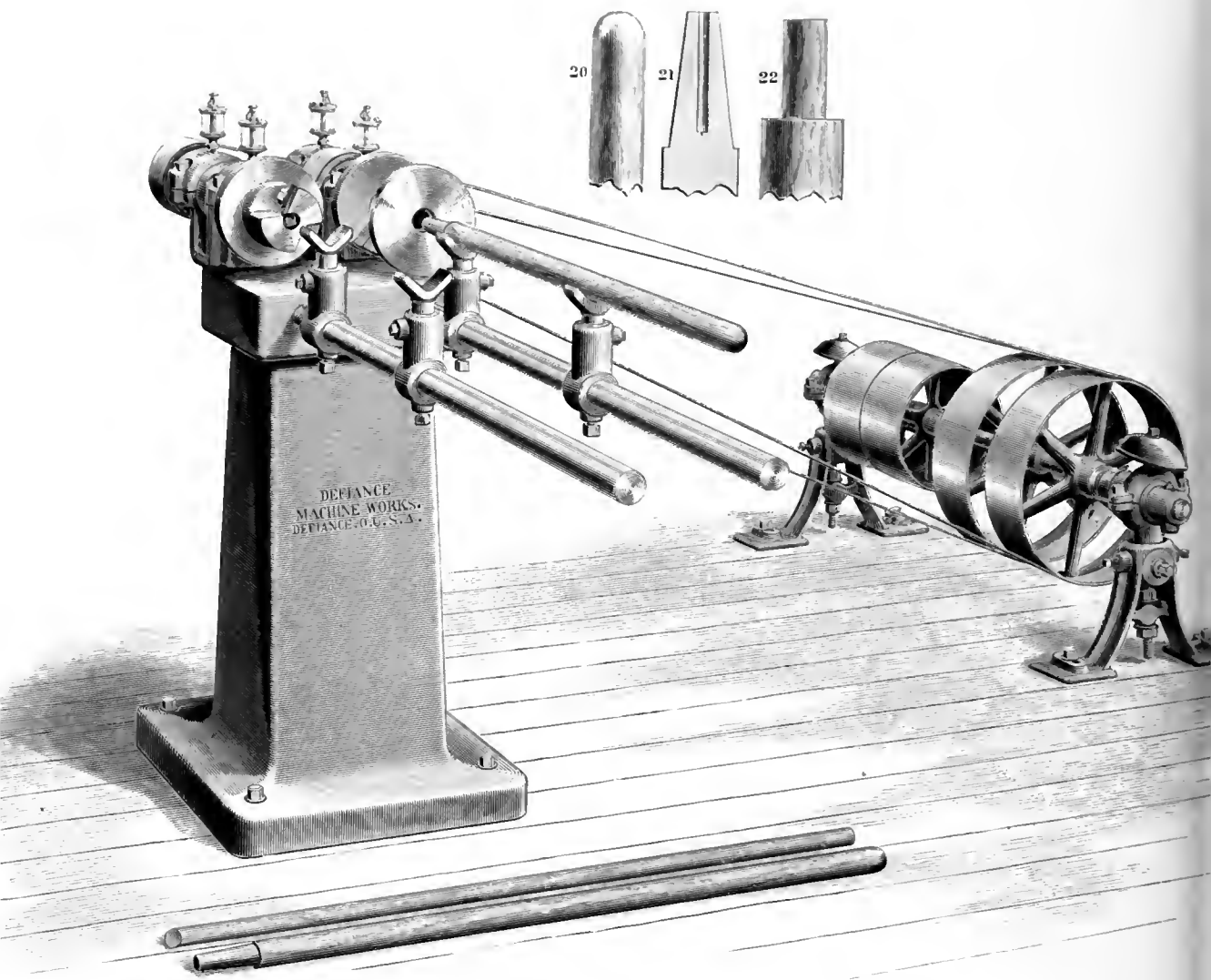
THE CUTTER HEADS for this machine can be quickly placed on or removed. A separate head is required for each of the several shapes as shown by the engravings. Heads for other shapes can be supplied if desired.

THE TABLE is fitted to the frame in planed angle ways and it rides upon friction rollers. All the surfaces are nicely fitted, allowing the table to slide to and from the cutter head with the greatest ease. The work to be operated upon is held at one end by self-centering jaws propelled by right and left hand screws operated by hand-wheel, which holds the work firmly and centrally with the cutter head. It is quick in its operation and very accurate.

THIS MACHINE is thoroughly built throughout, with large substantial bearings, and adapted to a range of work reached by no other machine of its class.

THE COUNTER is furnished as follows: Two No. 1 ball and socket adjustable drop hangers; one belt shipping apparatus complete; countershaft, $1\frac{7}{16}'' \times 36''$ long; driving pulley, $15'' \times 4''$; tight and loose pulleys, $10'' \times 5''$; speed, 1,000 rotations per minute; pulley on machine, 5″ diameter 3″ face; speed, 3,000 rotations per minute.

HORSE POWER to drive, $\frac{1}{2}$; floor space occupied, $24'' \times 40''$.



No. 2 Improved Double Spindle Chucking and Boring Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 22 Feet.

Cable Word, CONE.

No. 2 Improved Double Spindle Chucking and Boring Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 22 Feet.

Cable Word, CONE.

THIS ENGRAVING represents an improved Double Spindle Chucking and Boring Machine, with one of its spindles fitted with a cutter head for rounding the end of handles, as shown by engraving No. 20; the other spindle is provided with a cutter head for cutting tenons, similar to No. 21 or No. 22, and it is arranged to bore the end of handles at the same time the tenon is cut; cutter heads of different sizes and shapes can be used for various classes of chucking and tenoning.

IT IS a most complete and convenient machine for handle making, as the rounding, tenoning, and boring of handles can be accomplished at one handling without stopping the machine or changing heads, which is necessary with a single head machine.

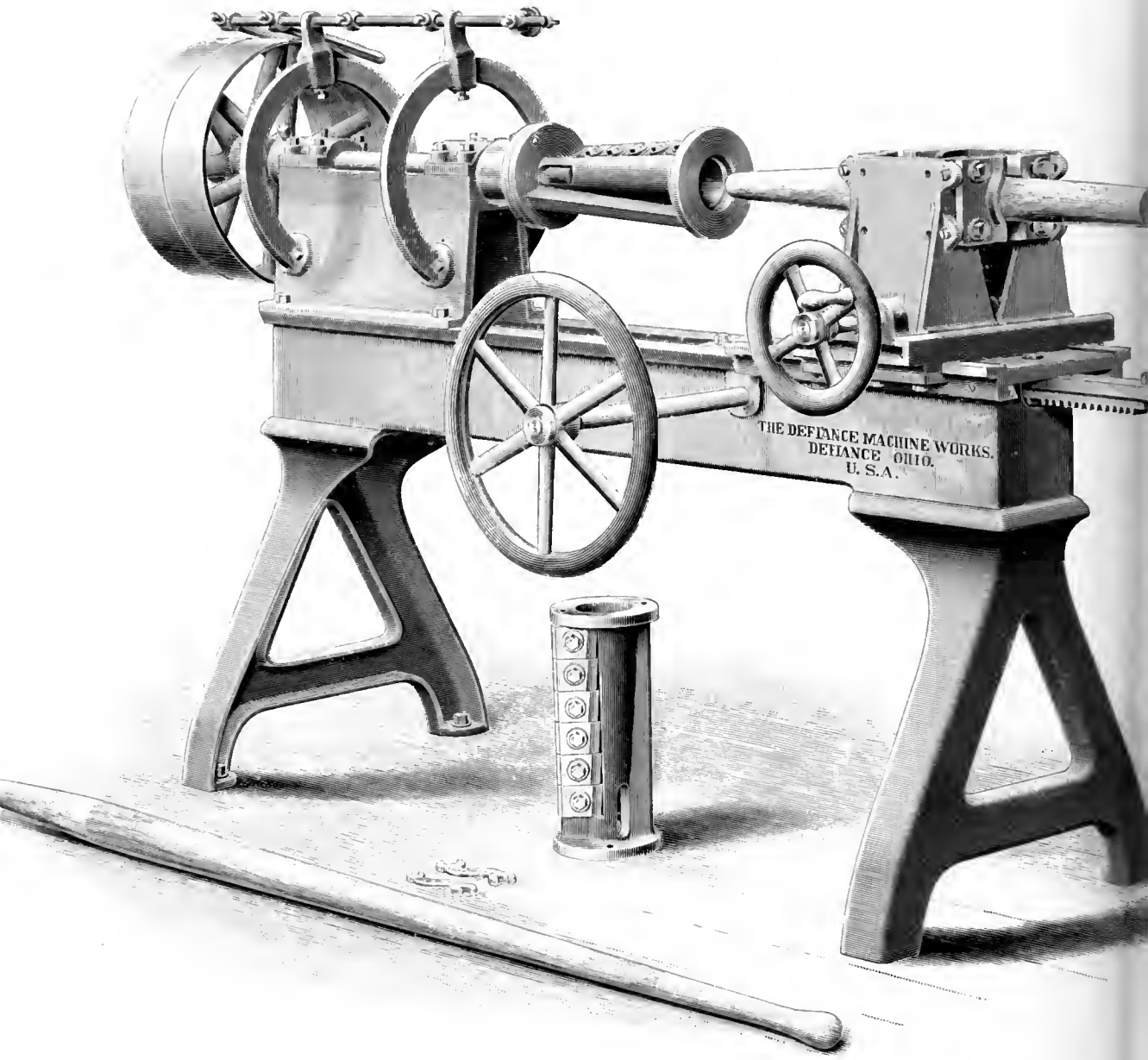
THE CUTTER HEAD SPINDLES are large in diameter and have a $1\frac{3}{16}''$ hole extending through them so that tenons of any length can be cut, or long rods, such as curtain poles, etc., can be fed through the machine. A gauge plug is fitted into each hole in the spindles, and they are used when cutting tenons for regulating the length of cut.

A SELF-CENTERING REST is provided for each cutter head, into which the material to be operated upon is placed and held true with the cutters, requiring no care on the part of the operator to properly place the material into the machine.

THIS MACHINE is constructed on a substantial iron frame cast in one piece with cored center; it is provided with large wearing surfaces which are accurately fitted, and it is calculated to cover a larger variety of uses than any other machine of this class.

THE COUNTER is supplied as follows: Shaft, $1\frac{7}{16}'' \times 48''$; two No. 1 ball and socket adjustable hangers; two driving pulleys, $15'' \times 4''$; tight and loose pulleys, $10'' \times 5''$; speed, 1,000 rotations per minute: size of pulley on cutter head spindles, $5'' \times 4''$; speed, 3,000 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, $22'' \times 72''$.



No. 3 Improved Heavy Chucking and Tenoning Machine.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 54 Feet.

Cable Word, CRESUS.

No. 3 Improved Heavy Chucking and Tenoning Machine.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 54 Feet.

Cable Word, CRESUS.

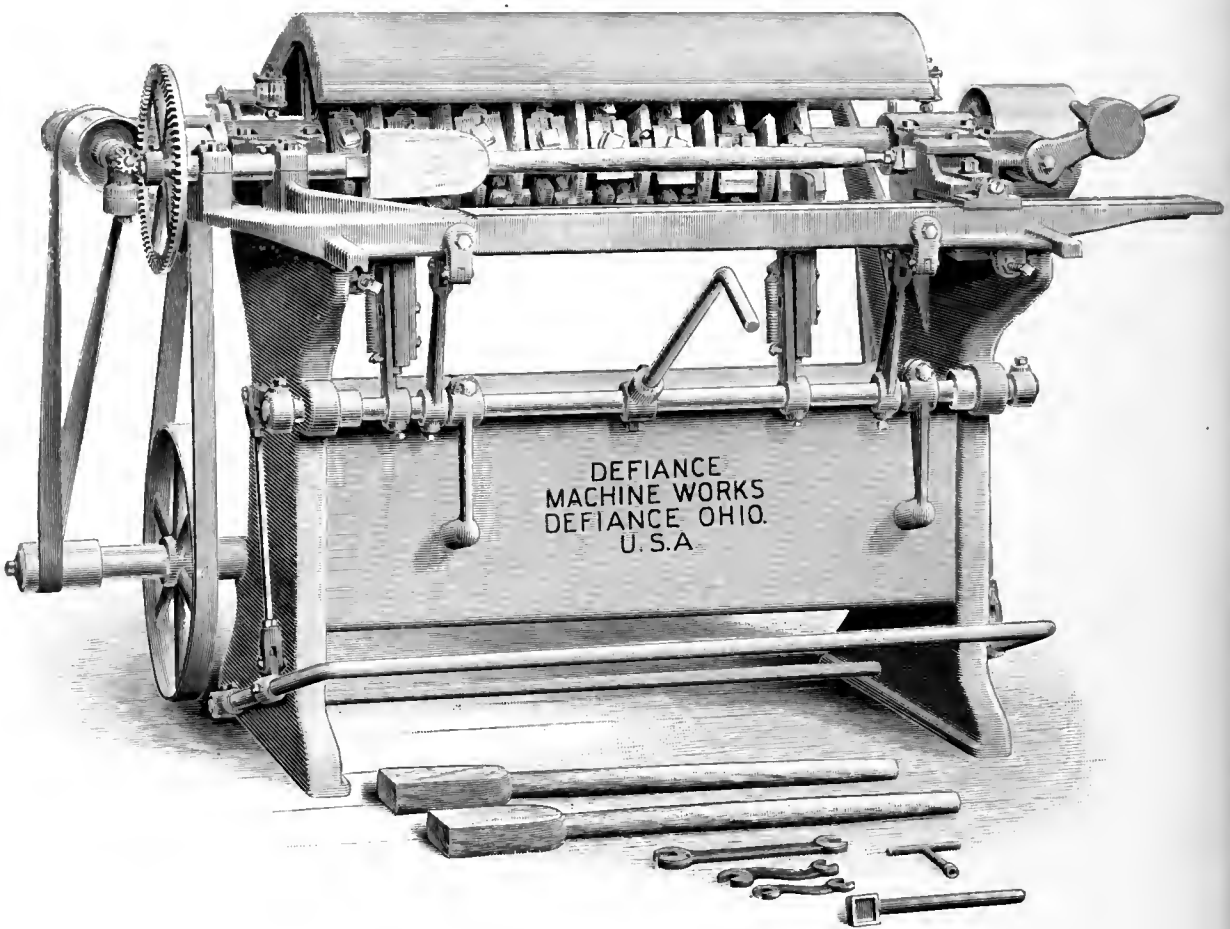
THIS ENGRAVING represents our No. 3 Improved Heavy Chucking and Tenoning Machine, especially designed for cutting tenons, pointing and rounding ends of cant hook levers, handles, stakes, and various other classes of turned woodwork. Cutter heads can be furnished to suit any requirement in this line, either for small or large work. It is capable of doing this class of work very rapidly and accurately.

THE FRAME of this machine, of iron, is cast in one piece, with cored center, making it strong and durable, so that it will not spring, and get out of alignment, and it is provided with a broad floor base to stand firm. The cutter head spindle is extra heavy and it runs in long self-lubricating bearings with the tight and loose pulleys fitted to the outer end, and they are provided with our improved belt shipping apparatus for moving the belt in starting and stopping the machine. The cutter head is held in position on the front end of the spindle by two steel bolts so that they can be quickly placed on or off the machine. In the center of the tenon head, a stop gauge is fitted to regulate the depth of cut. The chuck for holding the work is self-centering. The jaws are propelled by a right and left hand screw operated by a convenient hand-wheel requiring no care on the part of the operator in placing material into the machine, as it always comes true with the cutter head.

THE CARRIAGE supporting the chuck is gibbed to the top of the frame in angle ways and it slides in a horizontal plane to and from the cutter head with the greatest ease by turning the large hand-wheel shown.

THE TIGHT AND LOOSE PULLEYS are 16″ diameter, 4″ face, and should run 600 turns per minute. They can be belted to from above, below, or either side.

HORSE POWER to drive, 1; floor space occupied, 24″ × 72″.



38″ Patent D Handle Turning Lathe.

Export Shipping Weight, 2,900 Pounds.

Net Weight, 2,400 Pounds.

Cubic Measurement, 84 Feet.

Cable Word, LUCITANIA.

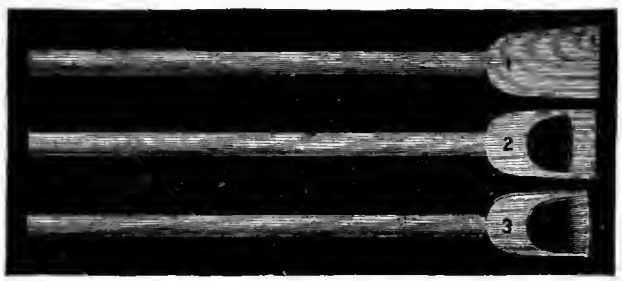
38″ Patent D Handle Turning Lathe.

Export Shipping Weight, 2,900 Pounds.

Net Weight, 2,400 Pounds.

Cubic Measurement, 84 Feet.

Cable Word, LUCITANIA.



THIS ENGRAVING represents our latest and most improved 38″ Patent D Handle Turning Lathe, especially designed for turning D handles for shovels, spades and forks. It is so constructed that the rough handle blank is placed into the machine and turned its full length at one time, smooth and true, at the rate of about 2,500 handles in ten hours.

THE FRAME is a heavy casting, with cored center and a broad floor base to stand firm and to overcome any tendency to jar or chatter, and enable the machine to be crowded to its full capacity without injuring the working parts and produce smooth, clean turning.

THE CUTTER HEADS of large diameter are fitted to a ground steel spindle 2¼″ diameter, running in long bearings of the ring oiling reservoir type. Each head is fitted with three shear cutting knives and a sufficient number are used to cover the longest handle to be turned, forming a continuous cut over the entire length of the handle. Different lengths of handles can be made by simply adjusting the tail stock horizontally on the table, which is also provided with a right angular adjustment to turn the handle parallel or to any taper. The diameter of the handle can be varied quickly by adjusting two screws underneath and at each end of the table.

THE TABLE, carrying the centers which support the material to be turned, is moved to or from the cutters by the use of a combined foot and hand lever, and when moved up to the cutters to the point where the turning shall begin, the handle blank is slowly rotated automatically against the cutters until finished, after which it is moved back towards the operator, when the feed is self-released for the removal of the finished handle and the reception of another handle blank.

A SELF-CENTERING DEVICE is furnished which enables the handle blank to be placed in the machine accurately and rapidly without any care on the part of the operator.

SAMPLE HANDLE No. 1 shows the product as it comes from this machine; No. 2, after having been punched by a special machine for that purpose; No. 3, the complete finished handle, turned, punched, rounded and chamfered ready for the market.

THE COUNTER is furnished as follows: Shaft, 2 3/16″ diameter; two No. 2 adjustable drop hangers; one driving pulley, 30″ × 6″; one pair of tight and loose pulleys, 14″ × 6″; speed, 600 turns per minute. Pulley on the machine, 8″ diameter × 6″ face.

HORSE POWER to drive, 5; floor space occupied, 38″ × 82″.

No. 21 Combined D Handle Jointing and Backing Machine.

Export Shipping Weight, 2,150 Pounds.

Net Weight, 1,650 Pounds.

Cubic Measurement, 83 Feet.

Cable Word, JEWEL.

No. 21 Combined D Handle Jointing and Backing Machine.

Export Shipping Weight, 2,150 Pounds.
Net Weight, 1,650 Pounds.
Cubic Measurement, 83 Feet.
Cable Word, JEWEL.

THIS ENGRAVING represents our No. 21 Combined D Handle Jointing and Backing Machine, which has been designed for the use of D handle makers, such as used for shovels, spades and forks. It joints and finishes complete both flat sides of the handle to the correct shape at one pass through the machine, doing the work smooth and true, entirely avoiding hand finishing, at the rate of about 5,000 handles in ten hours, with unskilled labor to operate it. Previous to the introduction of this machine this work was finished by two separate operations.

THE FRAME is a heavy casting in one piece, with cored center, with a broad floor base to stand firm. It is of sufficient strength to properly support the working parts and keep them in perfect alignment, and produce a smooth, clean cut in the hardest wood.

THE CARRIAGE is supported upon non-friction wheels, which travel upon planed V shaped tracks, and is fitted with gibs at each end. It runs exceedingly light and easy and cannot raise from the tracks or chatter. The top of the carriage is fitted with a system of stops and gauges so that the operator can quickly place the handle into the machine in the correct position without care or trouble

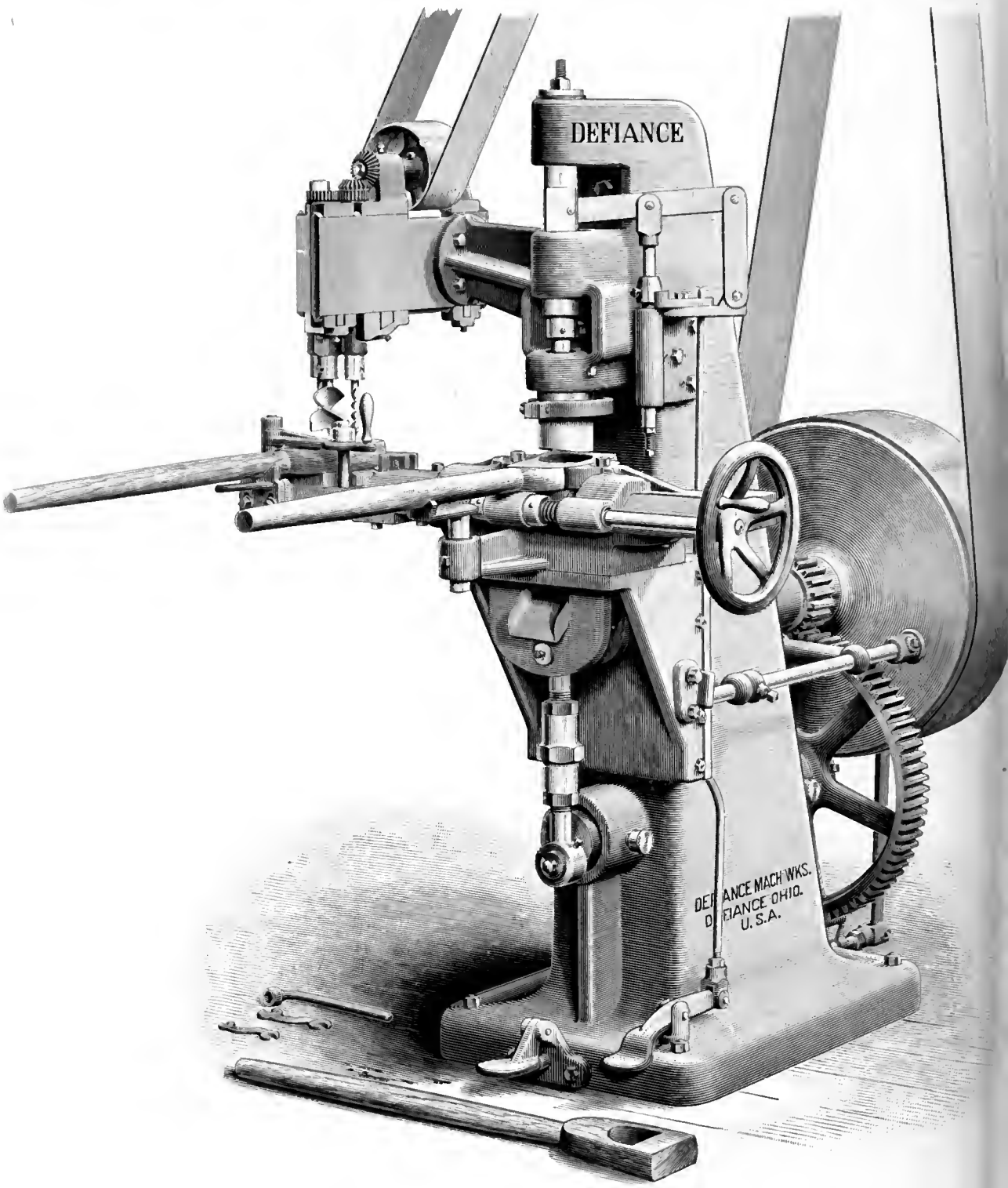
THE SADDLES supporting the cutter head spindles are gibbed to the upright and are adjustable vertically by convenient hand screws for handles of different thickness.

THE CUTTER HEAD SPINDLES are ground steel of large diameter and they rotate in genuine babbitt metal self-lubricating bearings.

THE CUTTER HEADS are equipped with shear cutting knives capable of cutting the hardest dry stock smooth and true without lifting the fiber, the lower head making a straight or parallel cut while the upper one is automatically oscillated and produces an oval shaped cut. A shield surrounds the upper head to protect the operator.

THE COUNTER is furnished as follows: Shaft, $1^{11}/_{16}'' \times 48''$; two ball and socket floor stands 36″ high; two driving pulleys, 16″ diameter × 4″ face; one pair of tight and loose pulleys, 10″ × 5″; speed, 1,200 rotations per minute; with the loose pulley fitted with bronze bearings.

HORSE POWER to drive, 2; floor space occupied, 84″ × 56″.



No. 75 Patent D Handle Mortising and Boring Machine.

Export Shipping Weight, 2,500 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 98 Feet.

Cable Word, MINTSELA.

No. 75 Patent D Handle Mortising and Boring Machine.

Export Shipping Weight, 2,500 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 98 Feet.
Cable Word, MINTSELA.

THIS ENGRAVING represents our No. 75 Patent D Handle Mortising and Boring Machine designed for cutting the eye in D handles for shovels, forks and spades. It will successfully handle hard or soft, green or dry stock without steaming. It accomplishes the work smooth and true at the rate of about 3,000 handles in ten hours with an inexpensive operator to handle it. Previous to its introduction this work required four different operations, first, to steam the material to soften it, second, to do the boring, and two to do the mortising.

IT IS so constructed that the entire work is accomplished by a single upward movement of the table, as two handles are placed into the machine at one time, one in the boring, the other in the mortising departments.

THE WORKING PARTS are mounted upon a substantial iron frame of neat design, cast in one piece, with cored center and with a broad floor base to stand firm.

THE TABLE upon which the handles are held is gibbed to the front of the frame and elevated to the cutting tools by powerful gearing, driven by a friction clutch, which can be instantly started or stopped by a slight touch of the operator's foot upon the pedal at the base of the machine. The handles are gripped and firmly held between self-centering jaws true with the cutting tools, requiring no attention on the part of the operator in placing the work in the machine.

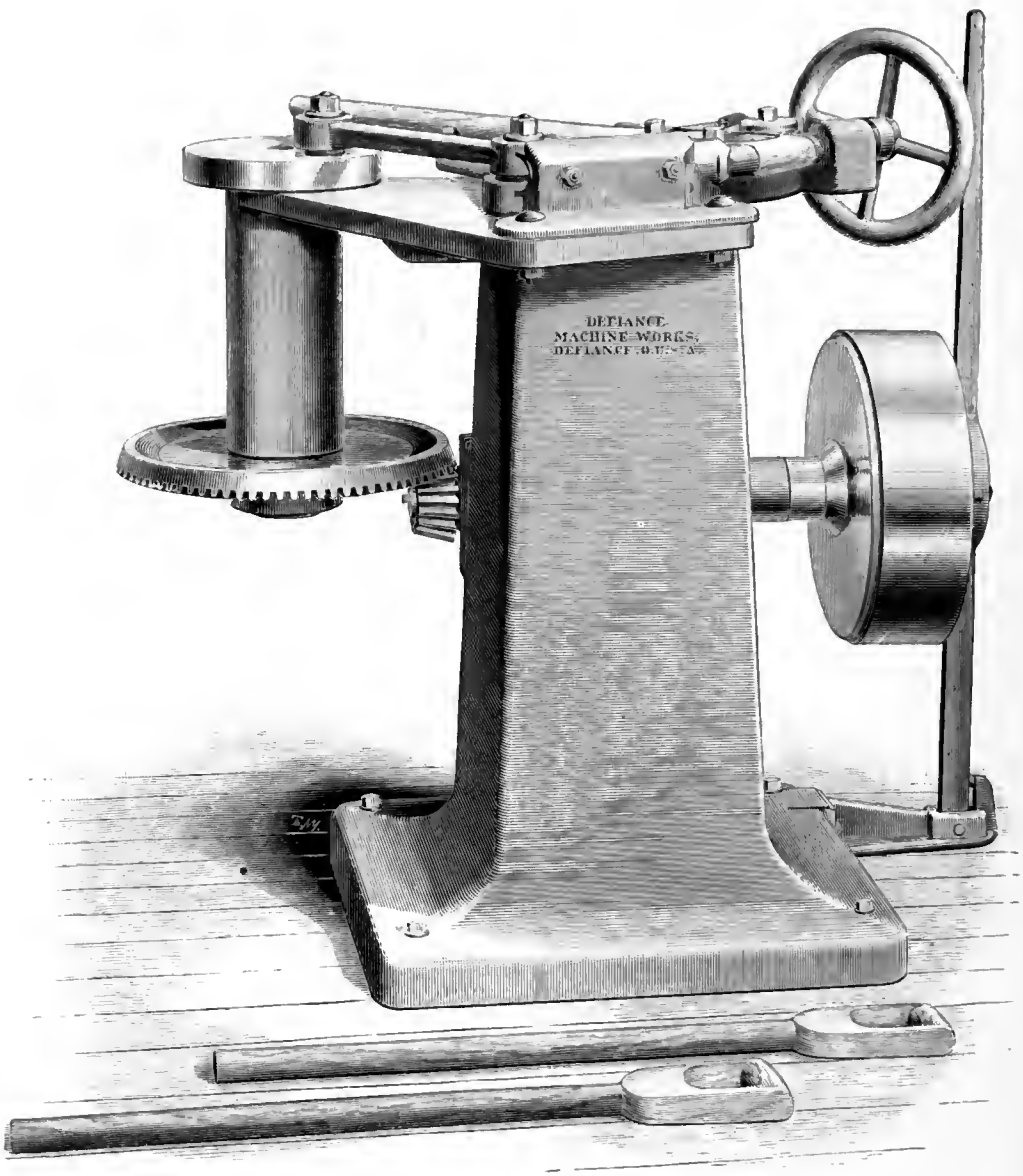
THE BORING DEVICE is fitted with one large and two small boring bits, removing as much of the stock as possible leaving a small surplus to be removed by the chisel, which is capable of cutting a smooth and true D shape hole without slivering or injuring the handle.

THE CHISEL, of new design, is made in halves and clamped together for the purpose of reducing their cost and enabling the average mechanic to produce them. It is fitted with an automatic chip removing device which discharges them through a spout underneath the table.

ALL THE BEARINGS, including the loose pulleys and idlers, of this machine are of bronze and self-lubricating, and all the gears are cut from the solid.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}'' \times 48''$ long; two No. 2 ball and socket J drop self-oiling hangers; driving pulley, $30'' \times 4''$; tight and loose pulleys, $12'' \times 5''$; speed, 500 rotations per minute; one double loose pulley, consisting of $24'' \times 5''$ and $10'' \times 6''$, driven from the main line shaft; pulley speed, 75 rotations for lifting the table.

HORSE POWER to drive, 2; floor space occupied, $31'' \times 58''$.



No. 1 Patent Automatic D Handle Shaping Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 40 Feet.

Cable Word, SOMBRE.

No. 1 Patent Automatic D Handle Shaping Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 40 Feet.

Cable Word, SOMBRE.

THIS ENGRAVING represents our No. 1 Automatic D Handle Shaping Machine, especially designed for rounding or shaping the outer portion of the hand hold on D handles, intended for shovels, spades, and forks.

IT IS so constructed that the entire cut or operation is performed at a single stroke of the machine, having a capacity for shaping 2,000 handles in ten hours, and doing the work true and smooth so that no hand labor is required.

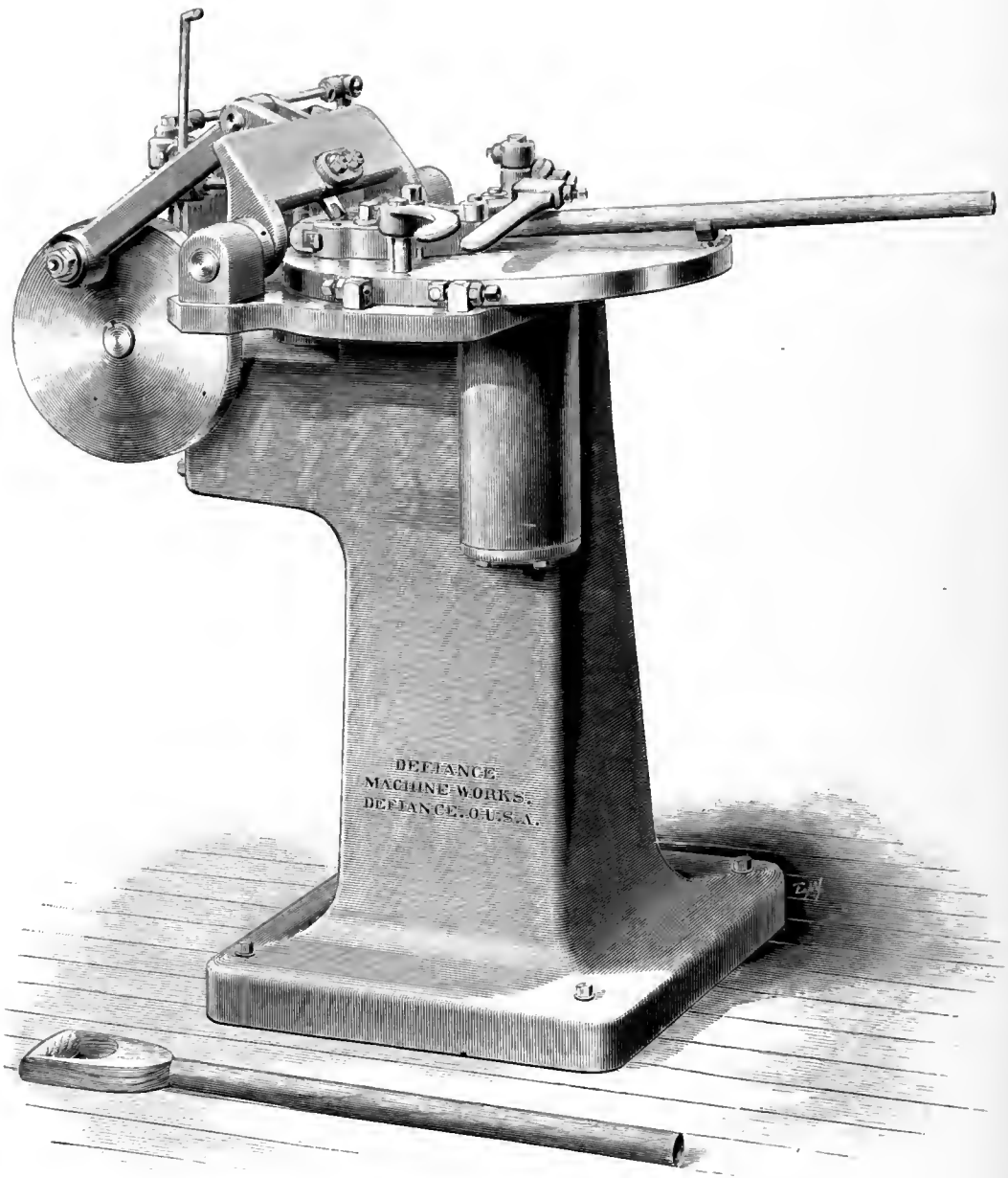
THE WORKING PARTS are mounted upon a heavy iron column of neat design, cast in one piece with cored center. By this design all tendency to twist or spring the parts out of alignment is defeated and an easy movement of the working parts is secured.

THE OSCILLATING CARRIAGE which supports the handle while being operated upon is fitted with self-centering jaws, propelled by hand screw which correctly centers and firmly holds the handle in position without any care on the part of the operator.

THE CUTTER is stationary; the carriage carrying the handle is moved to it. A single movement completes the operation. The driving mechanism consists of cut gears operated by a friction cluteh which is conneeted by a convenient hand lever, giving the operator instant control over the movement of the carriage.

THE FRICTION DRIVE pulley is 16″ diameter, 4″ face, and should run 50 revolutions per minute; countershaft, $1\frac{1}{8}'' \times 42''$; receiving pulley, $24'' \times 4''$, and driving pulley, $8'' \times 4''$; two No. 1 hangers; speed of countershaft, 100 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $31'' \times 44''$.



No. 2 Patent Automatic D Handle Shaping Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 48 Feet.

Cable Word, SPANNY.

No. 2 Patent Automatic D Handle Shaping Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 48 Feet.

Cable Word, SPANNY.

THIS ENGRAVING represents our No. 2 Patent Automatic D Handle Shaping Machine, which has been designed to automatically shape or round the inside portion of the hand hold of D handles for shovels, spades, and forks. Previous to the introduction of this machine this work was accomplished entirely by hand, which was not only slow and expensive, but faulty, from the fact that a true circle could not be secured, neither was the work performed smoothly.

THIS MACHINE is provided with all the necessary adjustments to accommodate either small or large handles, and is especially recommended for the purpose of reducing the labor, increasing the capacity, and improving the quality of the work. It is so simple that it can be handled by inexpensive labor and perfect work expected of it.

THE FRAME is a substantial casting in one piece with cored center, making it stiff and reliable. The working parts are mounted upon it and are so arranged that the handle to be operated upon can be instantly gripped in a self-centering chuck to the proper position without any care on the part of the operator.

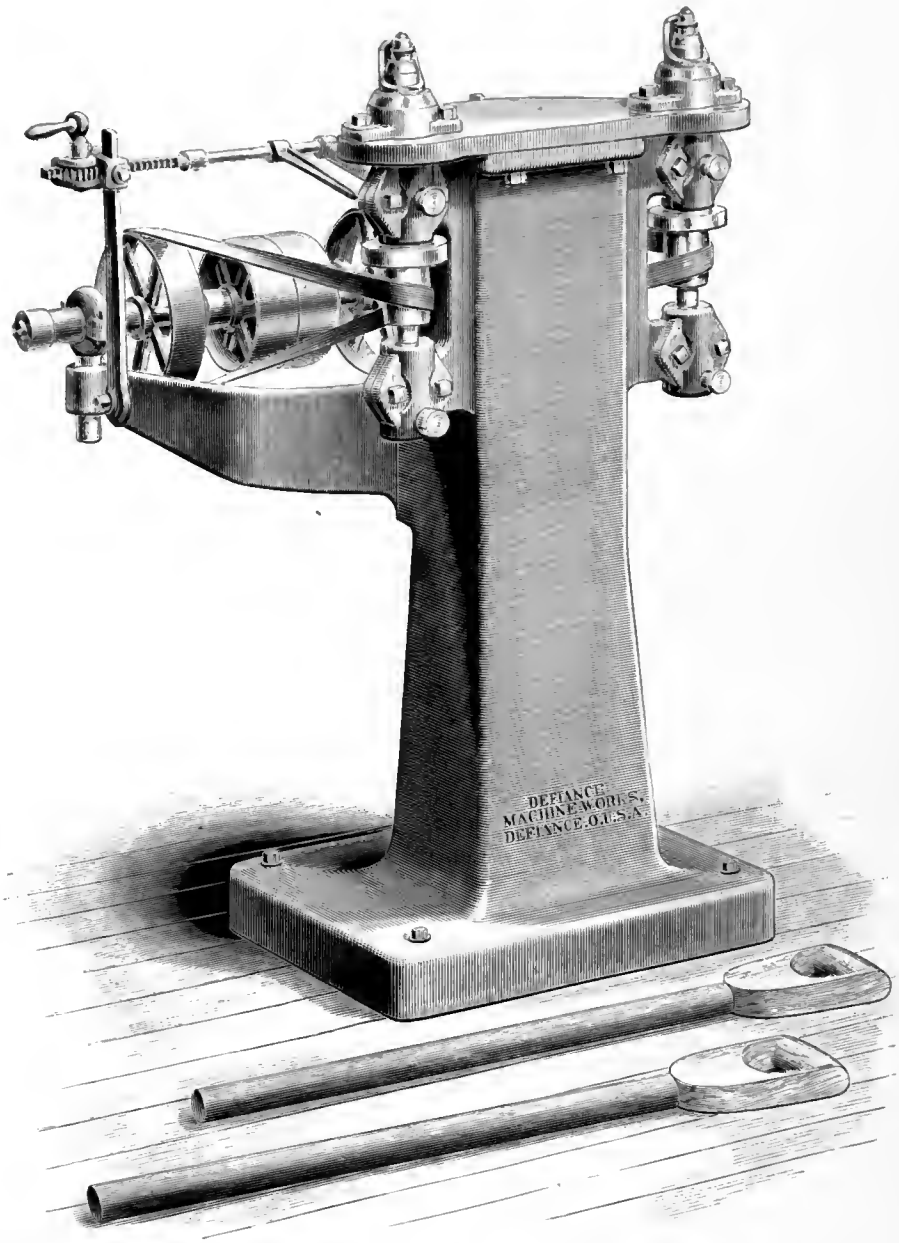
THE CUTTER BAR is driven by a friction clutch which can be instantly started or stopped, giving the operator perfect control over the machine. One cut is all that is required to finish the work, leaving neat, round corners or fillets for strength at either side. Square corners can be made if desired by simply changing the shape of the cutter.

THE CAPACITY of this machine is about 1,000 handles per day, requiring two machines to keep up with our complete system.

THE FRICTION PULLEY is 16″ diameter, 4″ face, and should run 20 turns per minute.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 42''$; receiving pulley, $24'' \times 4''$; driving pulley, $4'' \times 4''$; two No. 1 hangers; speed, 100 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $40'' \times 42''$.



No. 3 D Handle Shaping and Finishing Machine.

Export Shipping Weight, 600 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 24 Feet.

Cable Word, SALAMANCA.

No. 3 D Handle Shaping and Finishing Machine.

Export Shipping Weight, 600 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 24 Feet.

Cable Word, SALAMANCA.

THIS ENGRAVING represents our No. 3 D Handle Shaping and Finishing Machine, which has been designed especially for rounding or chamfering the corners of shovel, spade, and fork handles. This portion of the work had previously been performed by hand with a draw shave, which proved objectionable as well as a very slow and expensive process, and rarely, indeed, was it possible to produce the work on two handles alike.

BY THIS NEW MACHINE and an inexpensive operator, 1,000 handles can be successfully finished in ten hours, with neat, beveled corners, each to exact size and shape, so smooth and perfect that no hand labor is required.

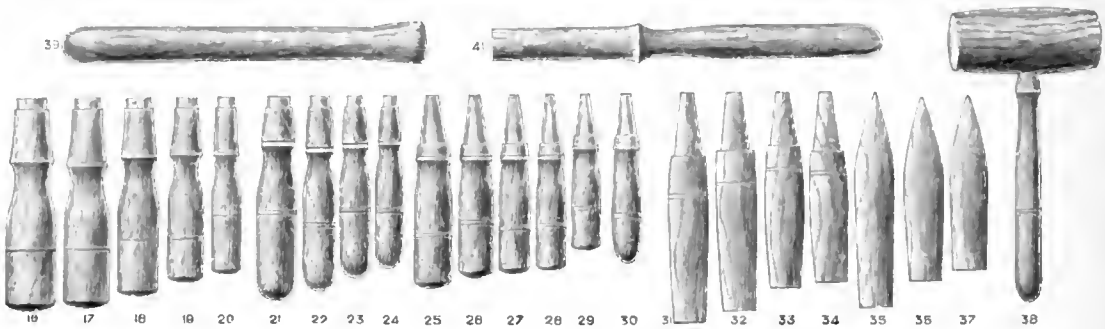
THE FRAME, of iron, is cast in one piece with cored center, with a broad floor base. It is of neat design and the machine is entirely self-contained.

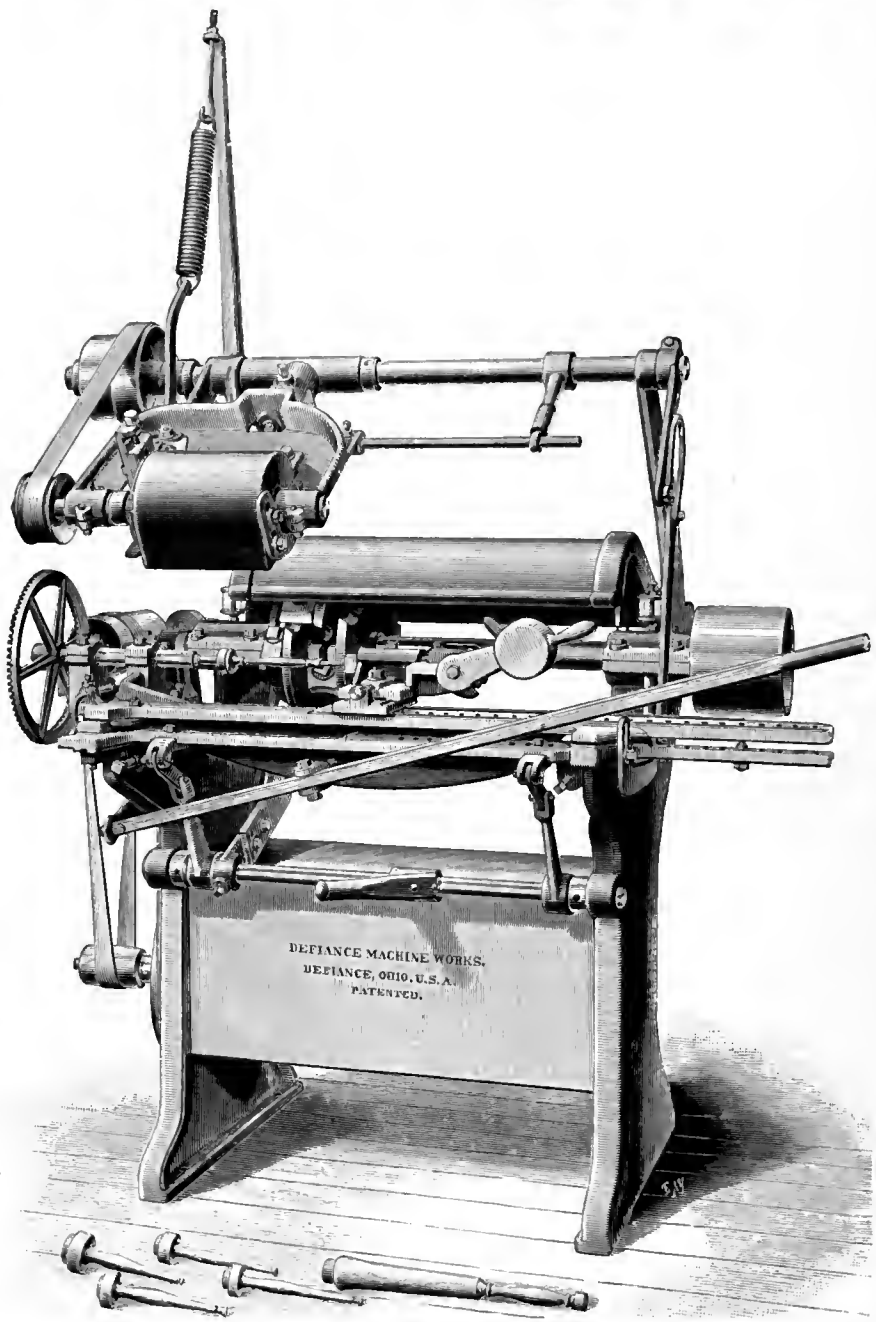
THE CUTTER HEAD SPINDLES, of steel, run in genuine babbitt metal, self-oiling bearings. The cutters, of an improved kind, will cut clean and smooth without tearing, and they are covered with a shield to protect the operator.

THE HANDLE TO BE OPERATED UPON is held in the hands of the operator throughout the entire process. The cutters are provided with guides to regulate the depth of cut, and every portion of the handle necessary to dress can easily be reached by swinging the handle to the required position.

THE COUNTER is attached to the rear of the machine and equipped with belt shipping apparatus. The tight and loose pulleys are 6″ in diameter and 2″ face, and should run 1,500 rotations per minute.

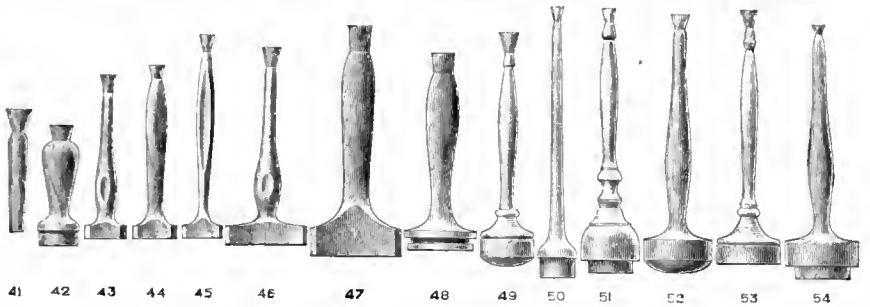
HORSE POWER to drive, ½; floor space occupied, 26″ × 31″.





24″ Patent Automatic Handle Lathe.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 2,400 Pounds.
Cubic Measurement, 97 Feet.
Cable Word, LIVELY.



24″ Patent Automatic Handle Lathe.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 2,400 Pounds.
Cubic Measurement, 97 Feet.
Cable Word, LIVELY.

THIS MACHINE has been designed for rapidly turning brush and tool handles similar to those shown by the engravings, Nos. 16 to 54, having a capacity of 3,000 to 3,500 handles per day.

IT RECEIVES the rough material, either hard or soft wood, and performs the turning complete at one operation, making each piece of a kind to exact size and shape, turning round, oval, hexagon, octagon, or square, as may be desired, in the most delicate sizes up to 6″ diameter and 24″ long.

THE MAIN FRAME supporting the working parts is of iron with cored center, and it is very stiff and reliable.

THE CUTTER HEADS are fitted to a 2¼″ steel spindle running in long, genuine babbitt metal bearings, and they are equipped with knives having cutting edges to correspond with the shape of the work to be turned; a sufficient number of heads are employed to cover the entire length of the piece to be turned; the heads and knives are numbered, so that in changing from one class of work to another it can be quickly accomplished.

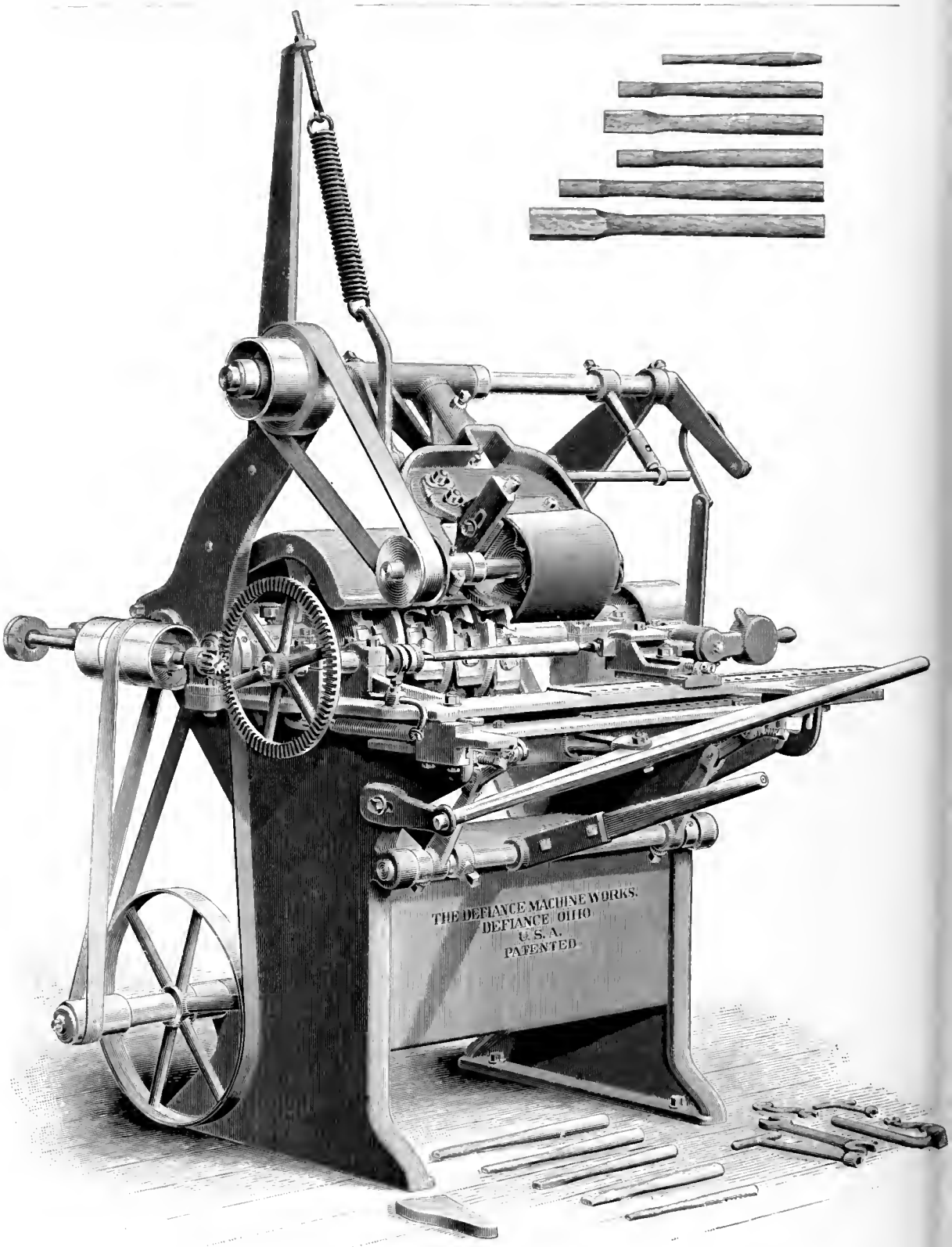
THE TABLE is adjustable in a most ingenious and useful manner. It is constructed in two parts, forming a double table. The lower half rests upon the main frame in angle ways and is gibbed to it. The upper part, upon which the centers are mounted, is pivoted to the lower half by a steel pin in one of the several holes through the tables upon which it oscillates, when performing oval turning; at the opposite end on the head center spindle an inexpensive cast iron cam or form is placed of proper shape to suit the style of work to be turned; this cam revolves against an upright shoe extending up from the lower table, and they are held together by a coiled spring. A convenient hand lever is used for sliding the table to and from the cutter heads. When advancing to the cutter heads at a point where the turning shall begin, the material to be turned is slowly revolved by an automatic feed; at the same time the upper table is oscillated in a path corresponding with the shape of cam or form and the material between the centers is turned the same shape as the cam. When the pivot which connects the tables is placed directly opposite the tail center, the machine will turn the material round at the center of oscillation and to the shape of the cam at the opposite end. In turning the same shape at both ends of the work, either round or irregular, the tables are locked together, and, by the aid of a second cam shoe attached to the main frame of the machine, both ends of the table may be oscillated alike. The diameter of turning can be varied from ¼″ to 6″ by simply adjusting two screws underneath the table.

THE TAIL CENTER is adjusted by loosening a single screw the desired distance from the head center for short or long turning, and it is provided with a transverse right angular adjustment with the table for doing taper turning.

THE SWINGING CUTTER HEAD is no less effective than ingenious. It advances and retreats from the work in an automatic manner; its position being controlled by the movement of the table, it is brought down to its work simultaneously with the beginning of the turning and when the table is moved backward to remove the turned material from the centers the cutter head is lifted out of the way by a spring balance. Its action upon the turning is controlled by a second cam or form placed upon the head center spindle, and it will faithfully follow the path of any shaped cam placed into the machine, either round, oval, hexagon, octagon, or square, its purpose being to turn and finish the eye end of handle when its shape differs from the body or the handle end; necessary adjustments are also provided to turn with it parallel or tapering in either direction and in varying diameters.

TIGHT AND LOOSE PULLEYS, 14″ × 6″; speed, 600 rotations per minute.

HORSE POWER to drive, 3½; floor space occupied, 38″ × 66″.



24″ Patent Automatic Hammer and Hatchet Handle Lathe.

Export Shipping Weight, 2,900 Pounds
Net Weight, 2,400 Pounds.
Cubic Measurement, 97 Feet.
Cable Word, LUNUM.

24″ Patent Automatic Hammer and Hatchet Handle Lathe.

Export Shipping Weight, 2,900 Pounds.

Net Weight, 2,400 Pounds.

Cubic Measurement, 97 Feet.

Cable Word, LUNUM.

THIS ENGRAVING represents our 24″ Patent Automatic Hammer and Hatchet Handle Lathe, especially designed for rapidly and accurately producing hammer and hatchet handles. It takes the rough stock and completes the work at the rate of about 3,000 handles in ten hours, with an inexpensive operator. It receives the handle blank, after it has been equalized to length, and performs the turning and the finishing of the eye end of the handle complete at one and the same time; it does its work so smooth that little, if any, finishing is required, and it turns the work to exact size and shape, turning the body of the handle round or oval, making the eye end round, oval, square, flat, six or eight sided, either straight or tapering, with quick adjustments to turn the various diameters and lengths, accommodating work up to 24″ long and any sizes under.

THE FRAME is a heavy casting with cored center. It is strong and substantial to properly support the working parts, and it is provided with a broad base to stand firm.

THE CUTTER HEAD SPINDLE, of steel, 2¼″ diameter, rotates in long, self-lubricating bearings. The bearing at the right hand end is removable. It is fitted to the top of the frame in planed angle ways, and locked in position by a single bolt. By slipping off the pulley and the box, and throwing back the hood which surrounds the cutter heads, free access is given to the cutter heads, so that they can be placed on or off the machine without removing the spindle. This new method enables the heads to be changed on the machine in a few moments time, for different kinds of handle turning.

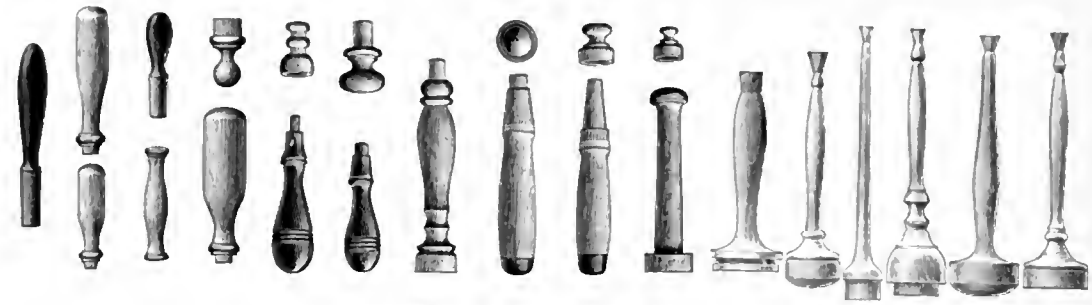
THE CUTTER HEADS each contain three shear-cutting knives, which cut perfectly smooth, entirely free from knife marks, and a sufficient number of heads are used to cover the entire length of turning, so that the entire handle is turned at one and the same time. All the heads are numbered so that they can be properly placed on the spindle without loss of time. A chart is furnished with the lathe, showing the correct position of each head on the spindle.

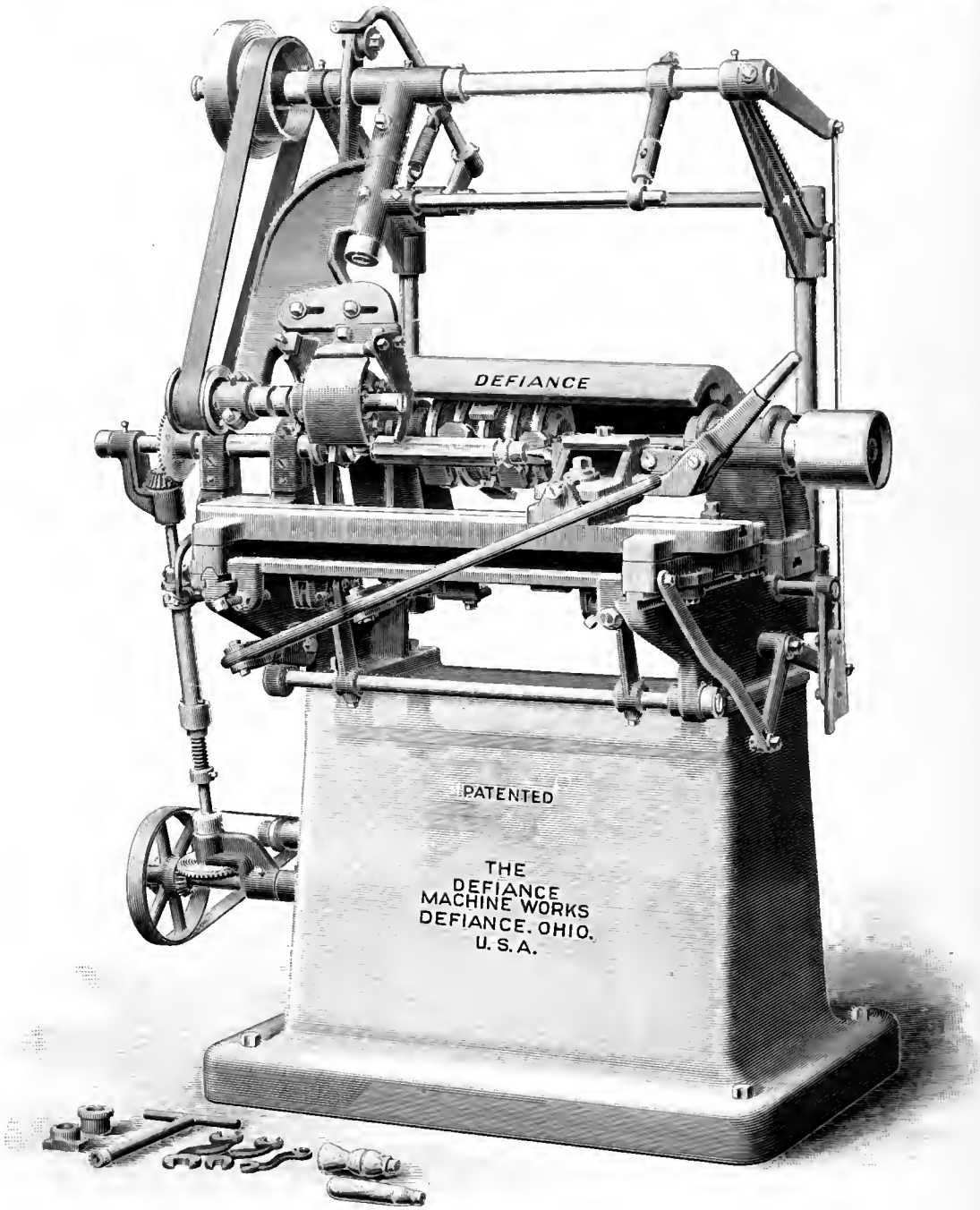
THE TABLE supporting the work is fitted to the top of the frame in planed angle ways, and thoroughly gibbed in position, and it moves to and from the cutters by a convenient hand lever. Adjusting stops at each end underneath the table regulate the diameter of the handle to be turned. The tail center has a horizontal adjustment to and from the spur center to accommodate the length of work. It is also provided with a right angular adjustment to turn the work straight or to any taper. To the spur center spindle, two cams or governing models are attached. One governs the shape of the body of the handle, and the other the eye end. These cams are attached to the spindle by a single screw, and they can be quickly placed on or off. An assortment is furnished for the various shapes of handles.

THE SWINGING CUTTER HEAD is calculated to shape the eye end of the handle. It advances and retreats from the work in an automatic manner. Its position is controlled by the movement of the table. It comes down and completes its work when the table is moved towards the cutters. The handle is then turned and the eye end finished to the shape of the cams or governing models used. Both portions are completed at the same time. The handle is automatically rotated against the cutters; two or three turns complete the work, after which the table is moved back for the removal of the finished product, at the same time the swinging cutter head is automatically lifted up out of the way, and the feed arrested, when another handle blank is inserted, and the operation repeated.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}'' \times 72''$; two No. 2 ball and socket adjustable drop hangers, with improved belt shipping apparatus attached; one driving pulley, $30'' \times 6''$, for cutter head spindle; one driving pulley, $18'' \times 3''$, for swinging cutter head; the tight and loose pulleys are $14'' \times 6''$, and should run 640 turns per minute. The pulley on the cutter head spindle is $8'' \times 6''$; speed, 2,400 turns per minute.

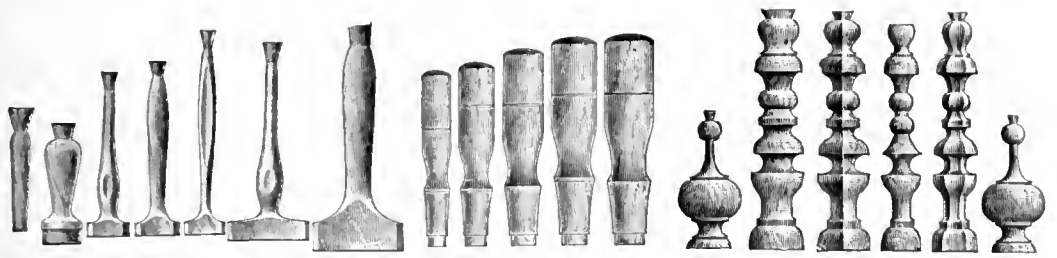
HORSE POWER to drive, 3½; floor space occupied, $38'' \times 66''$.





No. 444 Patent Automatic Turning Lathe.

Export Shipping Weight, 1,900 Pounds.
Net Weight, 1,400 Pounds.
Cubic Measurement, 74 Feet.
Cable Word, LEBIR.



No. 444 Patent Automatic Turning Lathe.

Export Shipping Weight, 1,900 Pounds.
Net Weight, 1,400 Pounds.
Cubic Measurement, 74 Feet.
Cable Word, LEBIR.

THIS MACHINE has been especially designed for a large class of delicate work within a range of 16″ in length and down, to a lesser diameter than heretofore attempted by this method of turning.

IT INCLUDES in its list, chisel handles, file handles, screw driver handles, in oval, flat, polygonal and round, carving tool handles, awl handles and brush handles of all sizes and variations demanded by the market in those objects. It will turn up to 3″ or 4″ in diameter and will therefore include the samples shown above and many others. It will turn these forms in any polygonal section desired, triangular, square, hexagonal, octagonal, oval, or round and in combinations of square and round. It will turn umbrella handles of the modern lance style in any transverse section desired; knife handles in round, rectangular, oval or flat section, to the smallest size demanded; artificial trolling minnows and like objects. It will turn all shapes of small balusters, ornamental spindles, knobs, terminals and hundreds of objects that cannot here be enumerated.

ALL PARTS OF THE MACHINE subject to quick movement are made sensitive and delicate enough to respond promptly to the will of the operator and produce good work; while the stationary and supporting parts are made exceptionally heavy and stable, for the purpose of reducing tremble and vibration to the smallest possible limit. All journal bearings are of bronze. The boxes for the main cutter head spindle are provided with both automatic oilers and oil cellars, together with sediment drains.

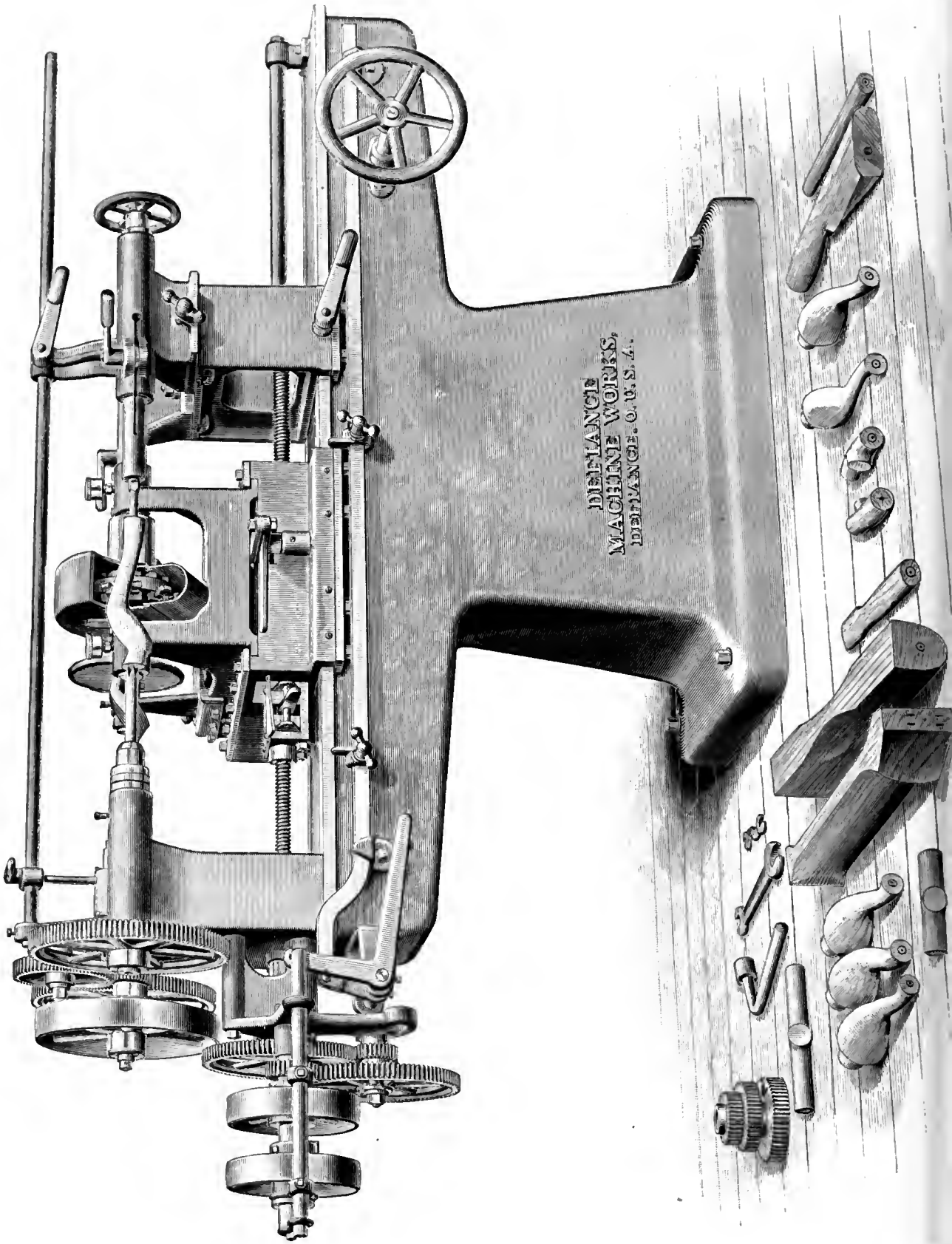
THE UPPER AND LOWER TABLES, which constitute the carriage for holding the piece to be turned, are gibbed to each other and to the frame; and the upper table is susceptible of an oscillating movement in obedience to a cam. By this means a stick may be turned polygonal at one end and gradually merged into a round section at the other; thus making a pleasing ornamental object. Or, the stock may be turned either polygonal or round the whole length according to adjustments at the will of the operator. Objects may be turned tapering from right to left, or from left to right, or parallel, without change of equipment.

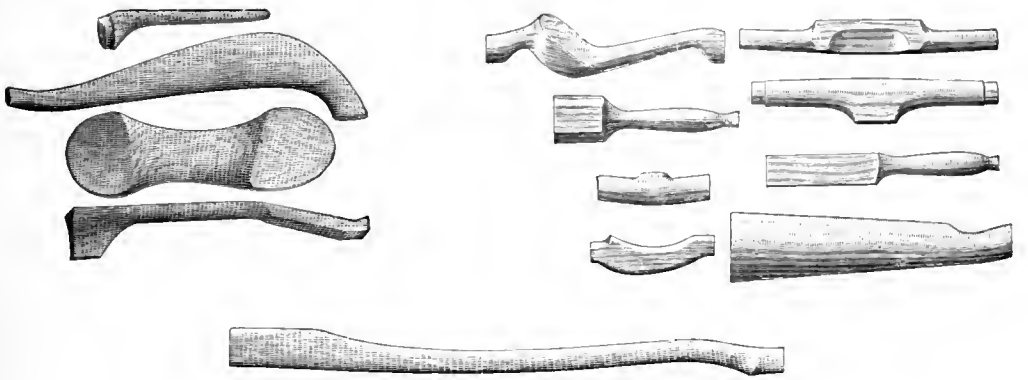
THE SWINGING FRAME carries an auxiliary cutter head for forming the ends of objects to different shapes, sizes and sections from the main parts, and its movements are guided by a cam of its own. The action of this frame is automatic in advancing and retreating, after being adjusted to its purpose. It may also be used to contribute much to the beauty of ornamental forms and also to insure the correct fitting of the eye ends of handles. It may be swung out of the way when not needed.

WE HAVE NAMED but a few of the possibilities of producing useful and pleasing forms and ornamental designs. Much depends on the skill and ingenuity of the operator in effecting combinations and symmetrical shapes, and when interest is once enlisted the capabilities appear infinite. This is the latest evolution in this class of machines, which, in our hands, have met and absorbed all competition throughout a period of forty years.

WE ARE PREPARED at any time to furnish designs for ornamental work, best adapted to suit the requirements of this class of turning, and at the same time to suit the most exacting artistic demands, if our patrons will describe to us the sizes of objects sought and the positions they are to occupy. Our experience has been such as to enable us to save the patron much time and perplexity.

TIGHT AND LOOSE PULLEYS, 10″ × 5″; speed, 800 turns per minute.
HORSE POWER to drive, 3; floor space occupied, 38″ × 48″.


DEFIANCE
MACHINE WORKS,
DEFIANCE, O. U. S. A.



No. 0 Patent Automatic Copying Lathe.

Export Shipping Weight, 2,700 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 108 Feet.

Cable Word, LIHUNG.

THIS ENGRAVING represents our No. 0 Patent Automatic Copying Lathe, which has been designed for accurately turning irregular shapes such as ax handles, hames, side bars for saddles, hat blocks, golf stick heads, gunstocks, handles, spokes, and other wooden articles from the most delicate sizes up to 42″ long, and finish various diameters up to 6″ at the largest. It will reproduce an exact facsimile of any model placed into the machine. In addition to this, either end of the product may be made larger or smaller than the governing model by a simple, quick adjustment of the machine. At an extra cost, and when especially ordered, it can be furnished with an attachment to turn both rights and lefts accurately from one model.

THE FRAME is a heavy casting of neat design, cast in one piece, with cored center and a broad floor base to stand firm.

THE HEAD SPINDLES to revolve the work to be turned and the model are fitted into long connected bearings, and they are driven by cut gearing, which insures a uniform motion and secures perfect turning.

THE TAIL SPINDLES stand opposite and in alignment with the head spindles, and they are adjustable horizontally together for work of various lengths with an independent horizontal adjustment by hand wheel and screw to place in and take out the work and model. They also have a right angular adjustment to change the size of turning at either end.

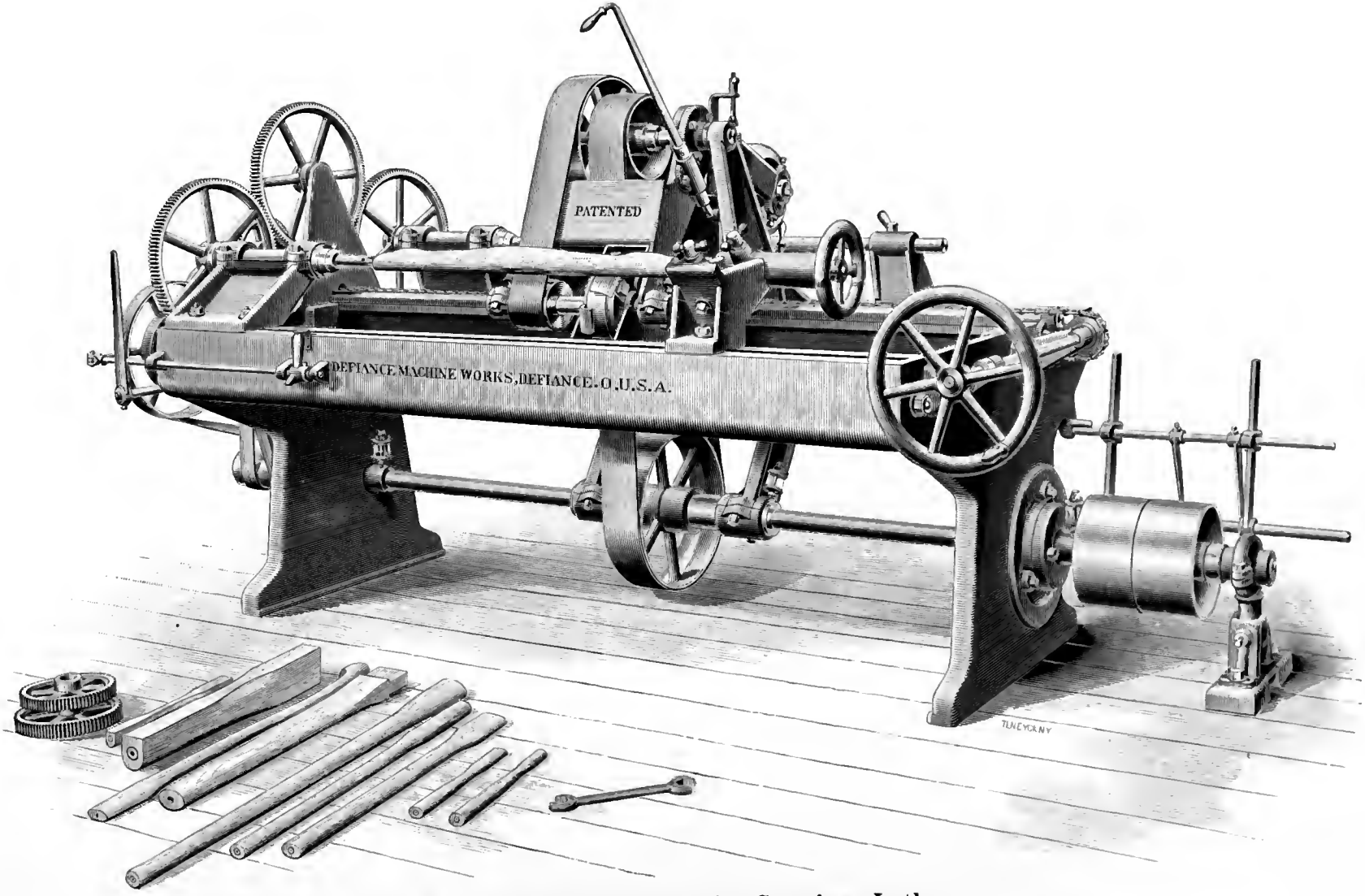
THE CUTTER HEAD CARRIAGE is accurately fitted and thoroughly gibbed to the main frame. It is traversed across the path of the material to be turned by means of a heavy screw driven by a double friction to feed from left to right and from right to left, starting to turn the material at either end. The frictions are automatically engaged or disengaged for starting or stopping the feed. The frame supporting the cutter head and guide roller is gibbed to the carriage and it vibrates in a path that corresponds with the shape of the model placed into the machine, and it is connected by a convenient hand lever to bring the cutter head up to its work or throw it back out of the way, which can be accomplished while the machine is in motion.

THE CUTTER HEAD is fitted with right and left hand cutters to feed both ways, and it is so constructed as to successfully turn either hard or soft wood, and produce smooth and satisfactory turning.

THE FEEDING MECHANISM is so constructed to turn, with the carriage feeding from left to right or from right to left, alternately, or it may be adjusted so as to feed in one direction only, and have the carriage returned by a quick automatic motion to the place of starting, and the starting station may be at the right or left hand end of the machine, as desired. It has five changes of feed from $\frac{1}{8}$″ to $\frac{3}{8}$″, varying $\frac{1}{16}$″ to each revolution of the work turned, and it can be started or stopped instantly. Adjustable stops are provided on a horizontal bar under the carriage for regulating the length of travel to the cutter head and they can be instantly set for short or long turning. When the end of cut is reached, the feed is automatically disengaged ready for the next cut.

THE COUNTER is furnished as follows: Three No. 1 ball and socket adjustable drop hangers, with new style belt shipping apparatus; one countershaft, $1\frac{7}{16}$″ × 90″; one drum for driving the cutter head, 16″ × 44″. The tight and loose pulleys are 8″ × 4″ and should run 625 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, 34″ × 86″.



No. 1 Patent Automatic Copying Lathe.

Export Shipping Weight, 4,500 Pounds.
Net Weight, 3,300 Pounds.
Cubic Measurement, 225 Feet.
Cable Word, LAKE.

No. 1 Patent Automatic Copying Lathe.

Export Shipping Weight, 4,500 Pounds.

Net Weight, 3,300 Pounds.

Cubic Measurement, 225 Feet.

Cable Word, LAKE.

THIS ENGRAVING represents our No. 1 Patent Automatic Copying Lathe, designed for turning from patterns all kinds of irregular shapes, such as hammer, hatchet, railroad and mining pick handles, gunstocks, spokes, neck-yokes, single-trees, and various other articles, turning work up to 8″ diameter, down to the smallest sizes, and up to 48″ long and anything shorter. It is constructed from entirely new designs, and it embraces important labor-saving features found in no other copying lathe. Its great strength and accuracy in workmanship renders it capable of increasing the quantity and improving the quality of its product. It is an exact facsimile lathe, reproducing work according to the pattern used.

THE FRAME of this machine is a heavy casting, with cored center, and broad floor base to stand firm.

THE CUTTER HEAD is fitted to a heavy steel spindle, running in long self-lubricating bearings attached to a vibrating frame on the carriage, which is traversed upon planed angle ways across the path of the material to be turned, by means of a heavy screw driven by cut gears, provided with three changes of speed to suit the various kinds of work. The hand lever, extending upward from the carriage, is used to bring the cutter head up to its work, or lock it back out of harm's way, when not in use. It will be observed that the knives cut on the under side of the material, discharging the chips downward out of the way, and overcoming any liability of injury to the operator.

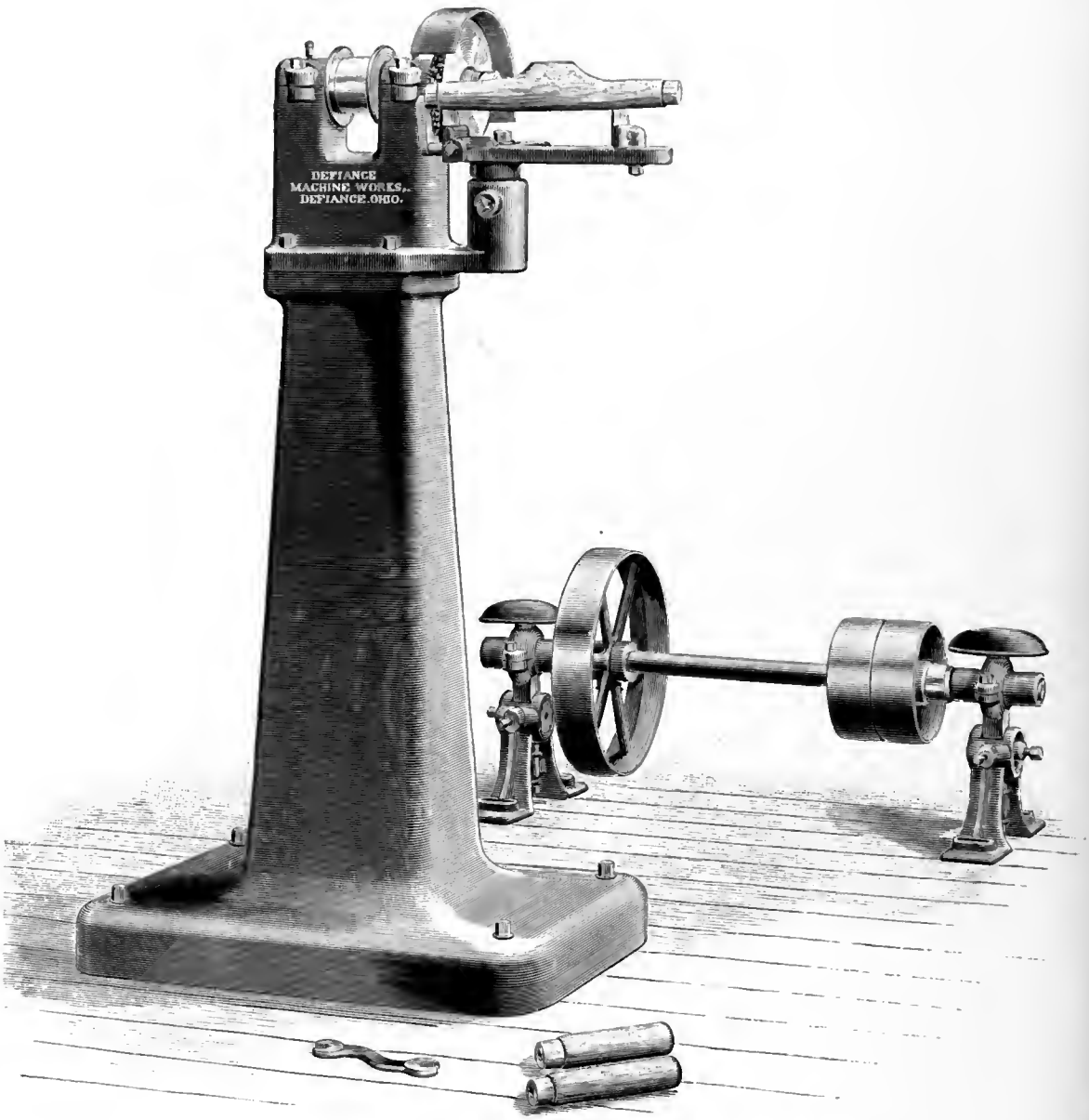
THE TAIL STOCK is fitted to the frame in planed ways, and provided with a horizontal adjustment to or from the spur center for short or long turning. It also has a right angular adjustment to change the diameter of turning at either end.

THE PATTERN which governs the vibrating path of the cutter head is placed between the centers at the rear of the machine, which can also be adjusted quickly for patterns of various lengths. The pattern should be an exact duplicate of the shape of the work desired to be turned, but the machine has an adjustment whereby the size of the article to be turned may be varied either smaller or larger than the governing model.

THE FEED is very powerful, with three changes of speed, and automatic in its action, stopping instantly when the end of cut is reached, or it may be arrested at any point desired, while the machine is in motion. It is provided with a quick adjustment, so that the carriage will traverse forward and backward to suit the exact length of the work to be turned. It will feed from left to right or from right to left, consequently the turning may begin at either end of the material, which effects a large saving in time.

THE COUNTER is a part of the machine. The tight and loose pulleys are 10″ diameter, 5″ face, with the loose pulley fitted with bronze bearings, and they should run 430 turns per minute.

HORSE POWER to drive, 4; floor space occupied, 54″ × 96″.



No. 1 Ferrule Seat Shaping and Boring Machine.

Export Shipping Weight, 500 Pounds.

Net Weight, 350 Pounds.

Cubic Measurement, 9 Feet.

Cable Word, FANTAN.

No. 1 Ferrule Seat Shaping and Boring Machine.

Export Shipping Weight, 500 Pounds.

Net Weight, 350 Pounds.

Cubic Measurement, 9 Feet.

Cable Word, FANTAN.

THIS ENGRAVING represents our No. 1 Ferrule Seat Shaping and Boring Machine, designed for the purpose of cutting ferrule seats on the end of handles and other wooden articles and boring the hole in the end for the reception of the tool. Both operations are performed quickly and accurately at one handling.

IT WILL cut the ferrule seats, or tenons, round, oval, square, hexagon, or octagon, either straight or tapering, with square or round shoulders, in various lengths and diameters, making the ferrule fit neatly, and bore the hole truly in the center to the desired depth and size, and other classes of work such as pointing, removing the stub ends as left by the turning lathe, cutting slots in the end of knife and saw handles, etc. All the adjustments of this machine can be quickly and easily made.

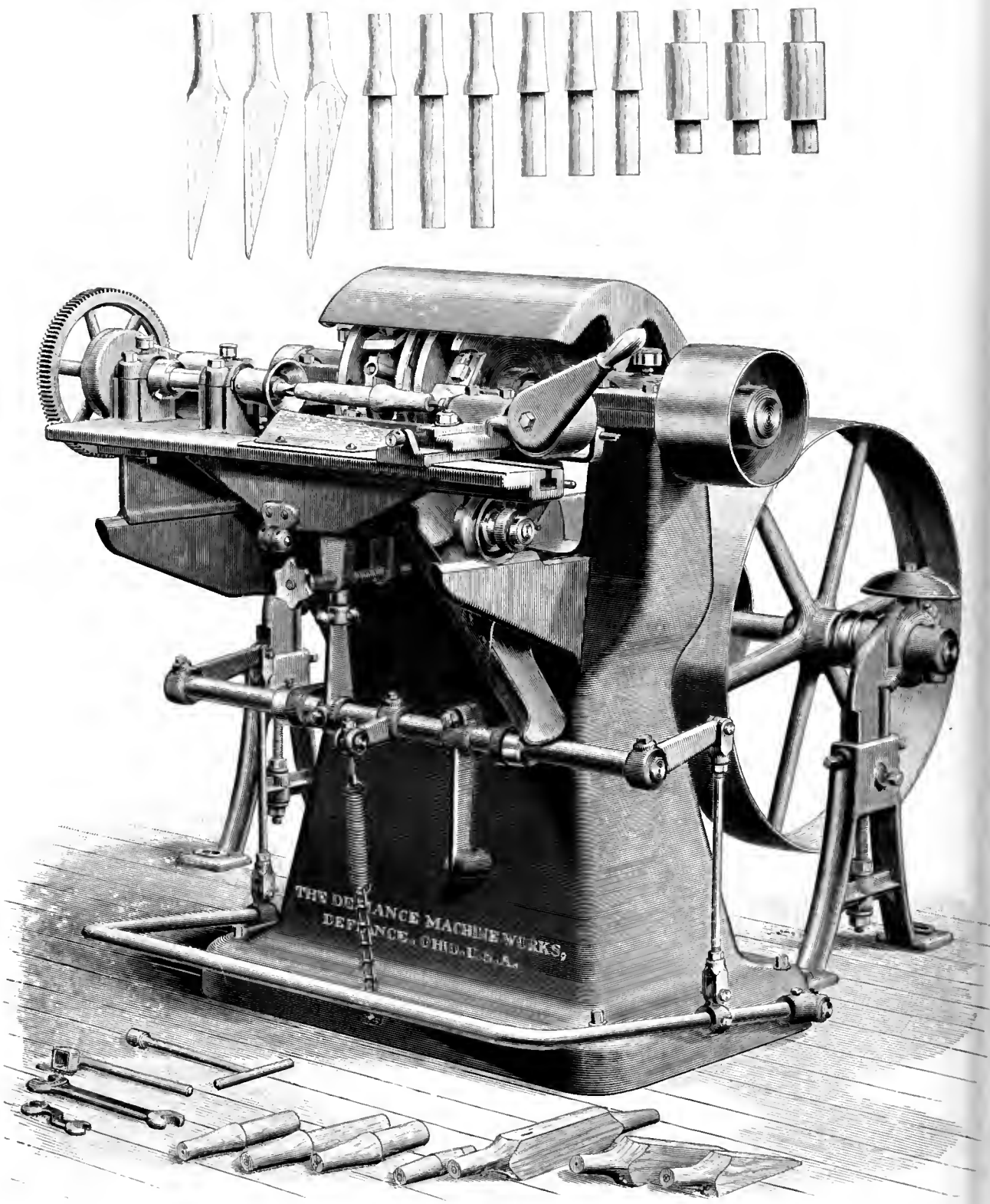
THE FRAME of this machine is exceedingly well designed and it is cast in one piece, with cored center and a broad floor base to stand firm, with the working parts accurately fitted to it.

THE CUTTER SPINDLE, of steel, runs in substantial self-lubricating bearings with the driving pulley between them. The cutters consist of a number of saws clamped together between suitable collars with a steel nut. The center of the spindle is provided with a small universal chuck to hold the boring bit. This is the equipment furnished for ferrule seating and boring. Special work would require special saws and tools.

THE TABLE supporting the work is so constructed to properly hold work of almost any shape. Adjustable stop gauges are provided to regulate the length and diameter of cut. The work is placed into the machine as shown, and revolved against the cutters by hand, a single rotation finishing the same. The boring is next performed by placing the work in the self-centering device provided for that purpose. This machine can be handled successfully by the cheapest labor.

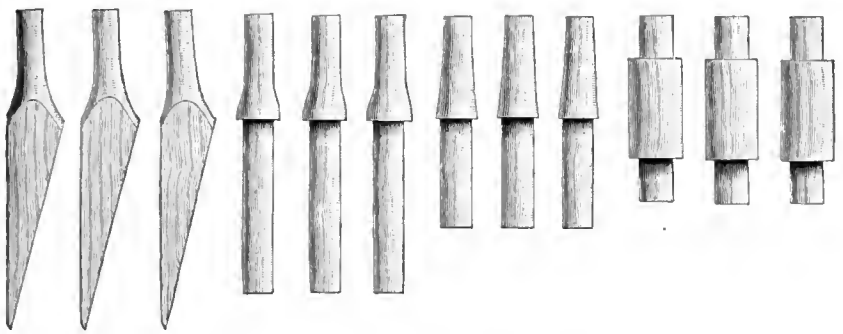
THE COUNTER is furnished as follows: Two No. 0 ball and socket adjustable drop hangers; shaft, $1\frac{3}{16}'' \times 30''$; one driving pulley, $12'' \times 2''$; tight and loose pulleys, $6'' \times 2''$; speed, 800 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $24'' \times 36''$.



No. 1 Patent Automatic Insulator Pin Turning Lathe.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,600 Pounds.
Cubic Measurement, 66 Feet.
Cable Word, LOCOMO.



No. 1 Patent Automatic Insulator Pin Turning Lathe.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,600 Pounds.
Cubic Measurement, 66 Feet.
Cable Word, LOCOMO.

THIS ENGRAVING represents our No. 1 Patent Automatic Insulator Pin Turning Lathe, especially designed for rapidly and accurately producing insulator pins and brackets of every kind from either hard or soft wood. It receives the rough stock after it has been equalized to length and performs the turning complete, smooth, and true, to exact sizes and shapes, making any number of pieces in exact duplicate, and with a cheap operator will produce about 9,000 insulator pins or 18,000 brackets in ten hours. The increased capacity on brackets over the pins is due to the fact that two brackets are turned at one time, after which they are sawed in two at the proper angle.

IT IS the most rapid and perfect machine ever invented for this work. With all the parts heavy and accurately fitted, the machine can be crowded to its full capacity without injuring it. The rough stock is placed into this machine with square corners or otherwise, and reduced to the finished product.

THE FRAME is a heavy casting in one piece with cored center and a broad floor base to stand firm, entirely free from jar or vibration when running.

THE CUTTER HEAD SPINDLE, of steel, large in diameter, runs in long self-lubricating genuine babbitt metal bearings, and it is equipped with heads and knives to cover the total length of the turning so that the material is turned its full length at one and the same time.

THE TABLE supporting the work is mounted to the frame at one end upon a friction roller, the other end on a true guide-way, and it moves towards the cutter head with the greatest ease by a slight pressure of the operator's foot upon the pedal at the base of the machine. When the foot pressure is released the table returns automatically. The work to be turned is placed into the machine in the usual way between self-centering centers, and slowly rotates as it is presented to the action of the cutters, and when finished it is automatically discharged through a spout at the right hand end of the machine, all of the shavings being delivered at the rear of the machine away from the finished product.

THE COUNTER is furnished as follows: Shaft, $1\frac{5}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers; one driving pulley, $30'' \times 5''$; one $2\frac{3}{8}''$ flange pulley for driving the feed; tight and loose pulleys, $12'' \times 6''$; speed, 600 turns per minute.

HORSE POWER to drive, 3; floor space occupied, $34'' \times 53''$.

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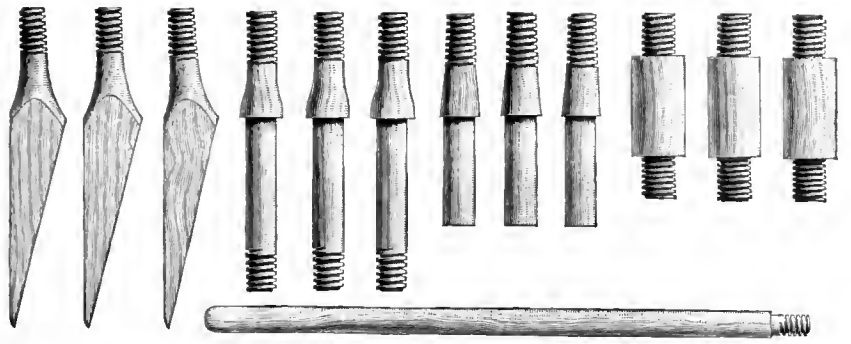
MACHINE WORKS,
DEFIANCE O. U.S.A.



No. 1 Patent Automatic Thread Cutting Machine.

Export Shipping Weight, 2,100 Pounds.
Net Weight, 1,500 Pounds.
Cubic Measurement, 86 Feet.
Cable Word, TONNEAU.

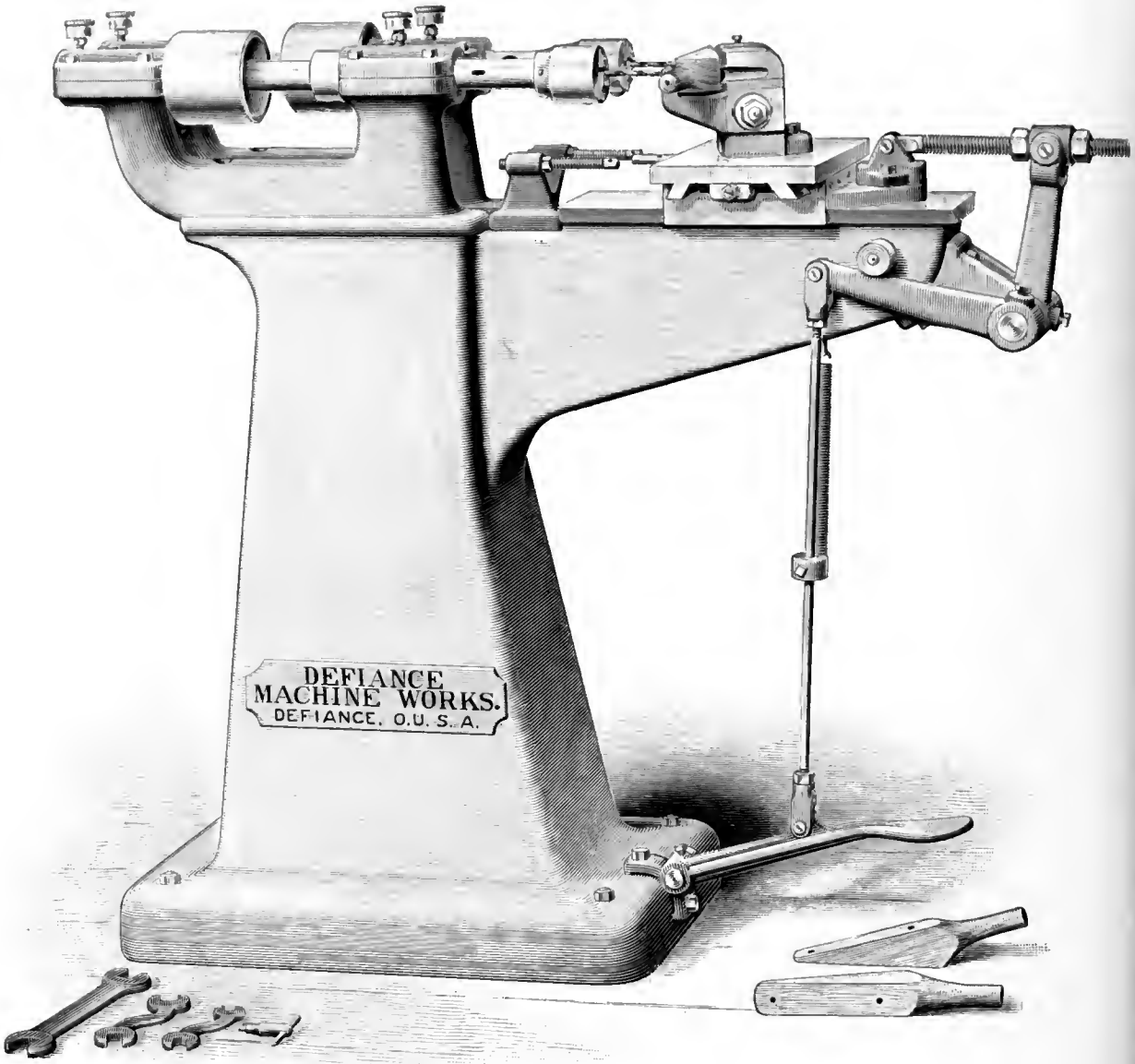
THIS ENGRAVING represents our No. 1 Patent Automatic Thread Cutting Machine, designed for cutting threads on wooden articles, such as insulator pins and brackets, spool and bobbin barrels, handles, etc., cutting any number of threads per inch, 3″ long and shorter on material up to 42″ long and under, in various diameters, cutting a smooth, clean, true thread close up to a shoulder on either hard or soft wood at the rate of about 18,000 pieces in ten hours.

THE FRAME is well designed and is cast in one piece with cored center, making it strong and substantial, and provided with a broad floor base to stand firm.

THE WORKING PARTS are accurately fitted to the frame. The piece to be threaded is placed between cup or cone centers, depending upon the nature of the work. The object to be threaded is always placed into the machine true with the cutters without any attention on the part of the operator. By a slight touch of the operator's hand on a spring lever the work is instantly fed forward to the cutter and back with the thread cut complete, and automatically discharged from the machine. No skill is required to handle the machine to its full capacity and secure absolutely perfect work. Automatic stops are attached to the tail stock to regulate the length of thread to be cut, and they are quickly set for threads of different lengths. The entire tail stock is provided with a horizontal adjustment for different lengths of stock. When adjusted for a certain class of work the operator simply feeds the machine. For threading duplex or double-ended insulator pins, with a thread at each end, one thread being 1½″ long, the other say 2″ long, or of different lengths, the machine is so arranged to cut both threads without any adjustment. After cutting one thread, the pin is simply reversed in the machine for the other operation.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 72''$ long; two No. 2 ball and socket adjustable drop hangers, with improved belt shipping apparatus; one driving pulley $30'' \times 3\frac{1}{2}''$, overhung on shaft; one drum, $16'' \times 44''$; tight and loose pulleys, $12'' \times 5''$; speed, 400 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, $30'' \times 82''$.



No. 14 Double Spindle Insulator Bracket Boring Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 34 Feet.

Cable Word, BATTERYING.

No. 14 Double Spindle Insulator Bracket Boring Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 34 Feet.

Cable Word, BATTERYING.

THIS ENGRAVING represents our new No. 14 Double Spindle Insulator Bracket Boring Machine, designed to bore two holes at one time at the proper angle through insulator brackets used for telegraph, telephone and electric light wires. It can also be used for various other classes of boring, using one or two boring bits as desired.

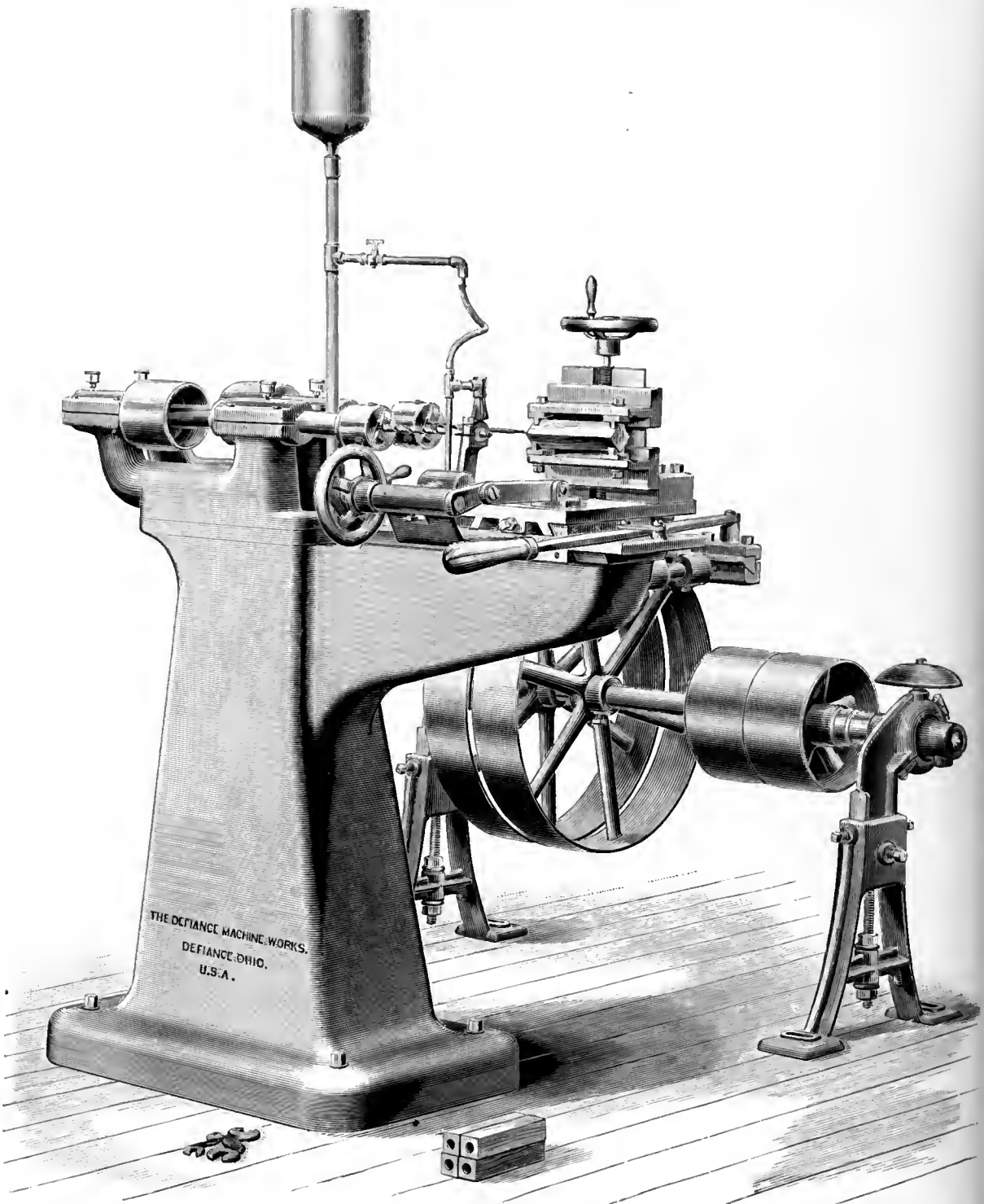
THE WORK is held in a self-centering chuck, requiring no care on the part of the operator in placing the work into the machine. The chuck is supported upon a sliding table gibbed to the overhanging bracket, and it is moved to the boring bits by the weight of the operator's foot upon the pedal. After the boring is performed the table is self-returning, consequently the operator has only to handle the stock and press the pedal.

THE FRAME, of neat design, is cast in one piece with cored center and a wide floor base to stand firm.

THE BORING SPINDLES, of steel, rotate in long self-lubricating bearings, and they are fitted with self-centering universal chucks for holding the boring bits.

THE COUNTER is furnished as follows: Shaft, 1 1/16" × 38"; two driving pulleys, 24" × 4¼"; two No. 2 ball and socket adjustable drop hangers; one improved belt shipping apparatus; tight and loose pulleys, 10" × 5", fitted with bronze bearings; speed, 450 turns per minute.

HORSE POWER to drive, 1; floor space occupied, 28" × 48".



No. 3 Patent Double Spindle Bobbin Boring and Reaming Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 34 Feet.

Cable Word, BOBOLINK.

No. 3 Patent Double Spindle Bobbin Boring and Reaming Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 34 Feet.

Cable Word, BOBOLINK.

THIS ENGRAVING represents our No. 3 Patent Double Spindle Bobbin Boring and Reaming Machine, which has been designed especially for boring and reaming the blanks from which bobbins are made, preparing the same for the turning lathe. Previous to the invention of this machine it required three operations to do the work, one for boring the straight hole and two for doing the reaming. With this new machine but two operations are necessary, one for boring and one for reaming, and its convenience provides a great increase in capacity over the old method.

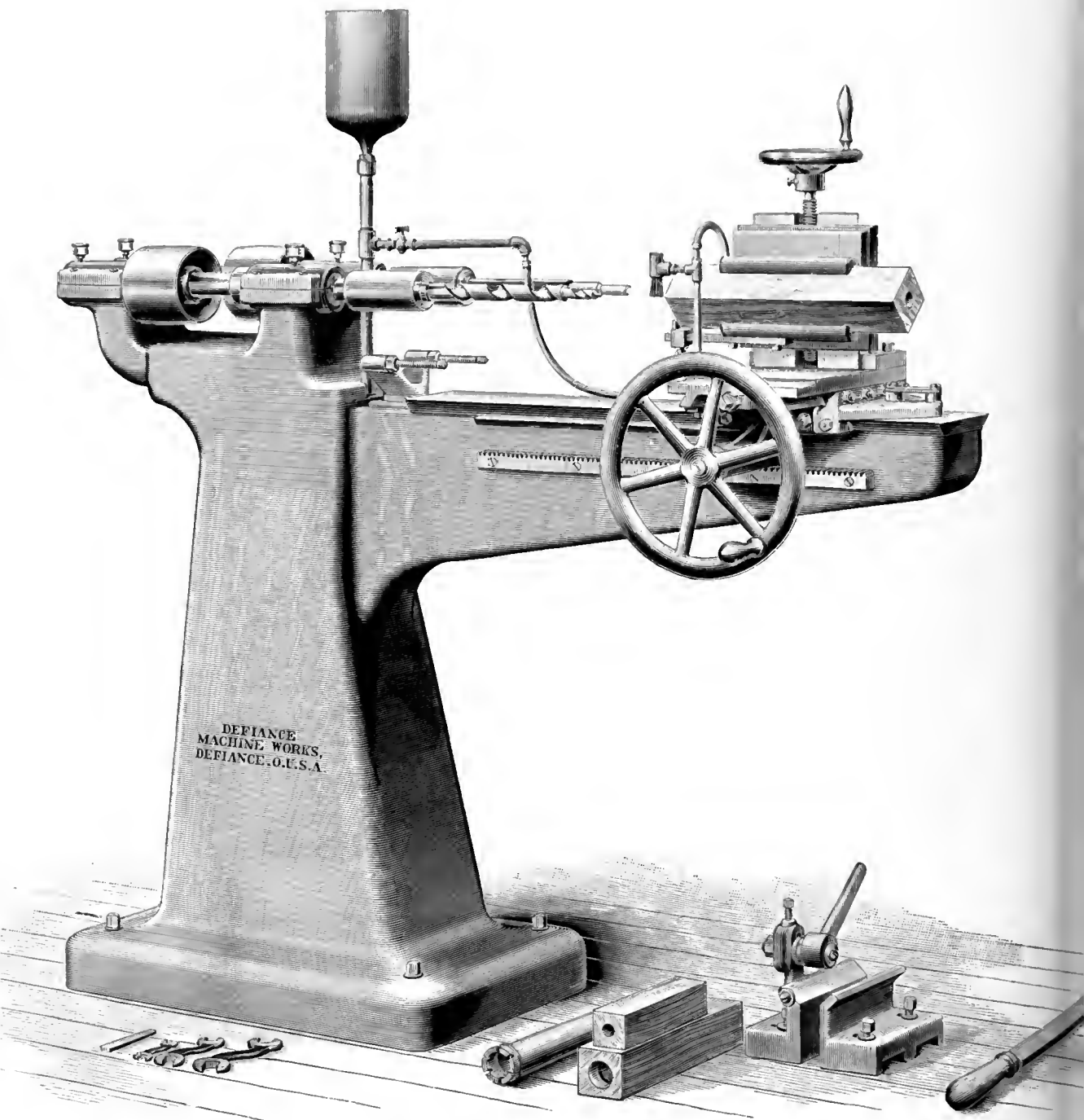
THE FRAME is cast in one piece with cored center; it is of neat design with broad base to stand firm, with the carriage overhanging the frame, so that the operator can stand close up to his work in an easy, uncramped position.

THE BORING AND REAMING SPINDLES, of steel, run side by side in long, self-lubricating bearings, and they are fitted with self-centering universal chucks for holding the bits true. The boring tool is capable of going clear through a bobbin blank without backing out. Its peculiar construction and clearance for the shavings renders this possible to a depth of 8″. The reaming tool is also of special design. It cuts the hole perfectly smooth, and does the counterboring complete in exact agreement with the shape and size of the spindle upon which it is used.

THE CARRIAGE, which supports the work, is gibbed and accurately fitted to the top of the machine. It is provided with a horizontal movement by a convenient hand lever to bring the work up to or from the bits. It is also provided with a quick right angular adjustment by hand-wheel to move the work instantly from one bit to the other, always centering the work accurately with either bit without any care on the part of the operator. The carriage is always locked rigidly in position when thrown to either bit so as to overcome any vibration and always bring the work central with the bits. The jaws for holding the bobbin square are self-centering and are actuated by a quick-acting right and left hand screw. They hold the work at each end, which entirely overcomes springing the blank, and, with the aid of an improved steady rest to the boring bit and a system of stop gauges for regulating the depth of boring and reaming, absolutely correct work can be secured by unskilled labor.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 38''$; two driving pulleys, $24'' \times 4\frac{1}{4}''$; two No. 2 ball and socket adjustable drop hangers with improved belt shipping apparatus attached. The tight and loose pulleys are $10'' \times 5''$, with the loose pulley fitted with bronze bearings, and they should run 450 turns per minute.

HORSE POWER to drive, 1; floor space occupied, $28'' \times 48''$.



No. 4 Patent Double Spindle Bobbin and Spool Barrel Boring and Reaming Machine.

Export Shipping Weight, 1,600 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 48 Feet.

Cable Word, BERGEARC.

No. 4 Patent Double Spindle Bobbin and Spool Barrel Boring and Reaming Machine.

Export Shipping Weight, 1,600 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 48 Feet.

Cable Word, BERGEARC.

THIS ENGRAVING represents our No. 4 Patent Double Spindle Bobbin and Spool Barrel Boring and Reaming Machine, which is heavier and adapted to a wider range of uses than our No. 3 machine. It is used for boring and reaming the blanks from which bobbins, spools, and handles are made. It prepares the work complete, ready for the turning lathe. Previous to the invention of this machine, it required three operations; one for boring the straight hole, and two for reaming. With this new machine, but two operations are necessary; one for boring from the solid, and one for reaming and finishing, all at one setting of the stock in the chuck, and a finer quality of work is secured at greatly increased capacity.

THE FRAME is a heavy casting in one piece, with cored center and a broad floor base to stand firm, the carriage overhanging the frame so the operator can stand close up to his work in an easy, natural position.

THE BORING AND REAMING SPINDLES of steel run side by side in long, self-lubricating bearings, and they are provided with self-centering Universal chucks to hold the bits true. The boring bit is provided with sufficient clearance and so constructed that true, straight holes can be bored up to 18″ deep, without backing out, which covers the longest bobbin work. The reaming tool is also of special design. It is made to suit the exact shape and size of the finished hole, and is intended to do any kind of counterboring; in fact, finish the hole in any kind of bobbin, spool, or handle work complete.

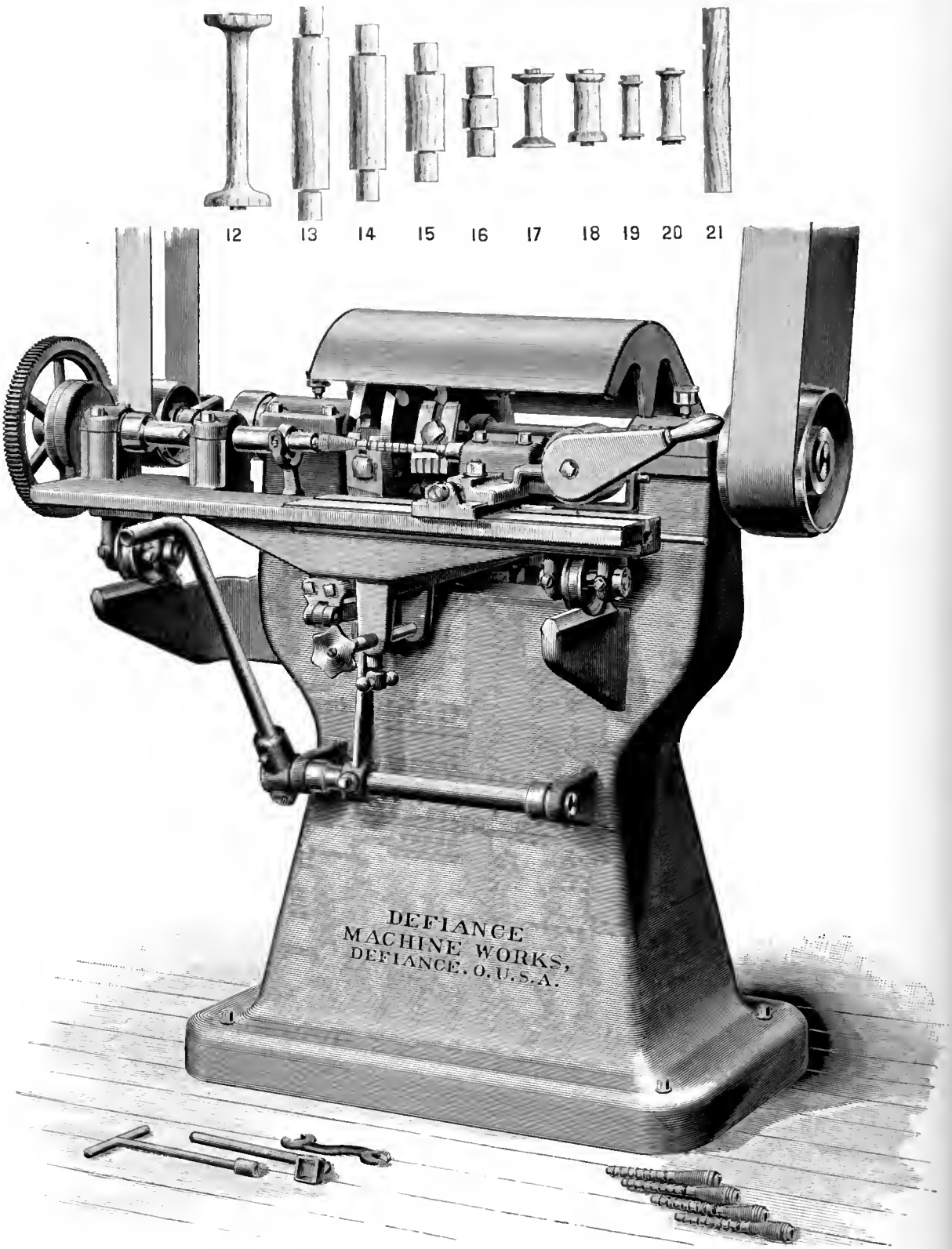
THE CARRIAGE which supports the work is gibbed and accurately fitted to the top of the frame. The horizontal movement for large deep boring is secured by hand-wheel, with rack and pinion, but for holes 8″ deep and shorter, a convenient hand lever is used instead. Both devices are furnished with the machine. The upper portion of the carriage is gibbed to the lower half, and it is provided with a quick right angular movement to center the work with either the boring or reaming tools. Stops are provided to bring the work always central with the bits without any care on the part of the operator.

THE SELF-CENTERING JAWS for holding the work are propelled by a right and left hand screw, operated by hand-wheel, and they grip the work firm and true with the boring and reaming tools. A gauge stop is fitted to the lower jaw, against which the work is placed to regulate the depth of hole to be bored. A convenient device is furnished as shown for cooling the bits when rapid work is required.

THIS MACHINE covers the entire field of boring and reaming bobbins, spools, handles, etc., and it has sufficient capacity to supply several modern turning lathes.

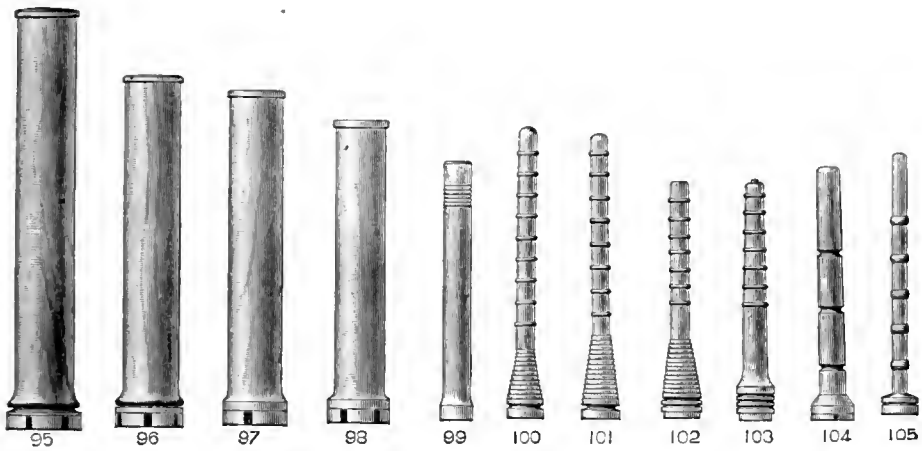
THE COUNTER is furnished as follows: One shaft, $1\frac{11}{16}'' \times 60''$; two ball and socket adjustable hangers; two $5'' \times 4\frac{1}{4}''$ pulleys; two driving pulleys, $24'' \times 4\frac{1}{4}''$; two pair tight and loose pulleys, $10'' \times 5''$; speed of one pair, 300, speed of the other pair, 500 rotations per minute, to accommodate small and large work.

HORSE POWER to drive, 2; floor space occupied, $26'' \times 62''$.



No. 3 Patent Bobbin and Spool-Barrel Turning Lathe.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,600 Pounds.
Cubic Measurement, 66 Feet.
Cable Word, LONESTAR.



No. 3 Patent Bobbin and Spool-Barrel Turning Lathe.

Export Shipping Weight, 2,000 Pounds.

Net Weight, 1,600 Pounds.

Cubic Measurement, 66 Feet.

Cable Word, LONESTAR.

THIS ENGRAVING represents our No. 3 Patent Bobbin and Spool-Barrel Turning Lathe, especially designed for rapidly and perfectly producing bobbins of all sizes and shapes, and spool barrels of all kinds, turning from the smallest sizes up to 7″ in diameter and 18″ long at the largest. A few samples as produced with this machine are shown by the accompanying engravings.

THIS MACHINE receives the rough material with square corners, or otherwise, and reduces the same to the finished product, complete, to exact size and shape, perfectly smooth, and at the rate of about 5,000 pieces per day. It does its work so accurate that no variation occurs in the turning. Where a large number of duplicate pieces are required, this machine is indispensable.

THE FRAME, of modern design, is a heavy casting in one piece, with cored center, and a broad floor base to stand firm, entirely free from jar or vibration when the machine is running.

THE CUTTER HEAD SPINDLE, of steel, large in diameter, runs in long, self-lubricating bearings and it is equipped with a sufficient number of cutter heads to cover the entire length of the material to be turned, so that the material is turned its full length at once. Different heads and knives are required for different shapes of turning, and they are numbered so they can be quickly interchanged from one class of work to another. The life of the cutters is very great on account of their depth and the large number used, which places a small amount of labor on each cutter to perform.

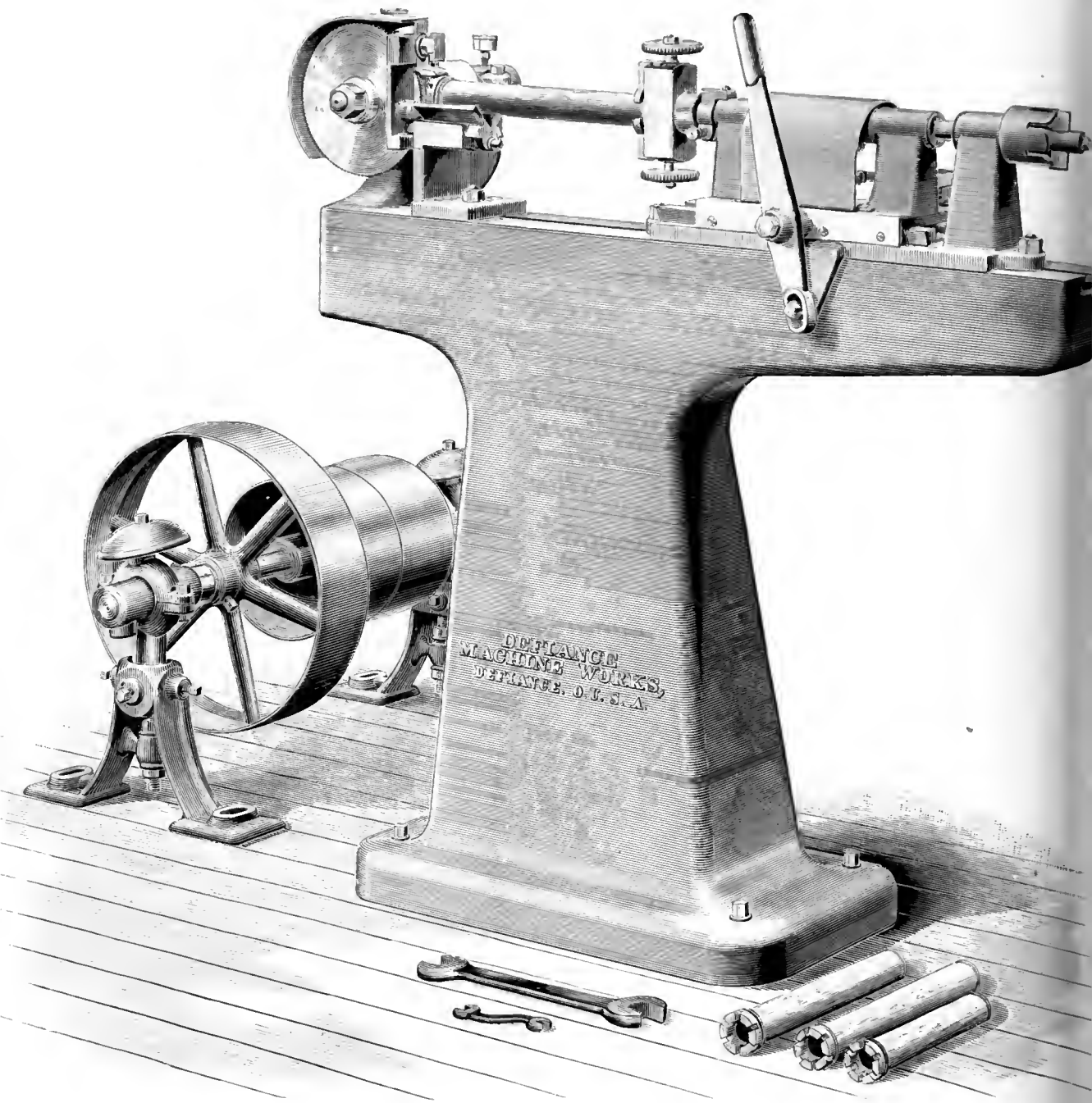
THE TABLE which supports the material while turning, is mounted upon V-shaped friction rolls which travel upon a track at each end and at the rear side of the machine, and it moves to and from the cutters with the greatest ease by a slight movement of a convenient hand lever, as shown. The centers holding the work to be turned are of special design to turn work that is bored, to center the work accurately by the hole, and thus turn the work perfectly true by the boring. The work is placed into the machine in the usual way and slowly rotates as it is moved to the cutters. When finished it is automatically discharged from the machine when the tail stock is released.

IT CAN be adjusted to turn work of different diameters by simply turning a single hand screw, and this adjustment can be made while the machine is running.

TURNED SAMPLES as produced with this machine will be sent upon application. Full sized samples or drawings should be sent to us before prices can be quoted, when the machine is to turn more than one sample.

THE COUNTER is furnished as follows: Shaft, $1\frac{5}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers; one driving pulley, $30'' \times 5''$; one $2\frac{3}{8}''$ flange pulley for driving the feed; the tight and loose pulleys are $12'' \times 6''$; speed, 600 turns per minute.

HORSE POWER to drive, 2; floor space occupied, $36'' \times 56''$.



No. 1 Improved Bobbin Grooving Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 33 Feet.

Cable Word, GONOCO.

No. 1 Improved Bobbin Grooving Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 33 Feet.

Cable Word, GONOCO.

THIS ENGRAVING represents our No. 1 Improved Bobbin Grooving Machine, especially designed for the use of bobbin manufacturers for rapidly and accurately cutting the grooves in the end of bobbins. It will do the work quickly with a cheap operator, and cut the grooves smooth and to exact size, without chipping or slivering the work.

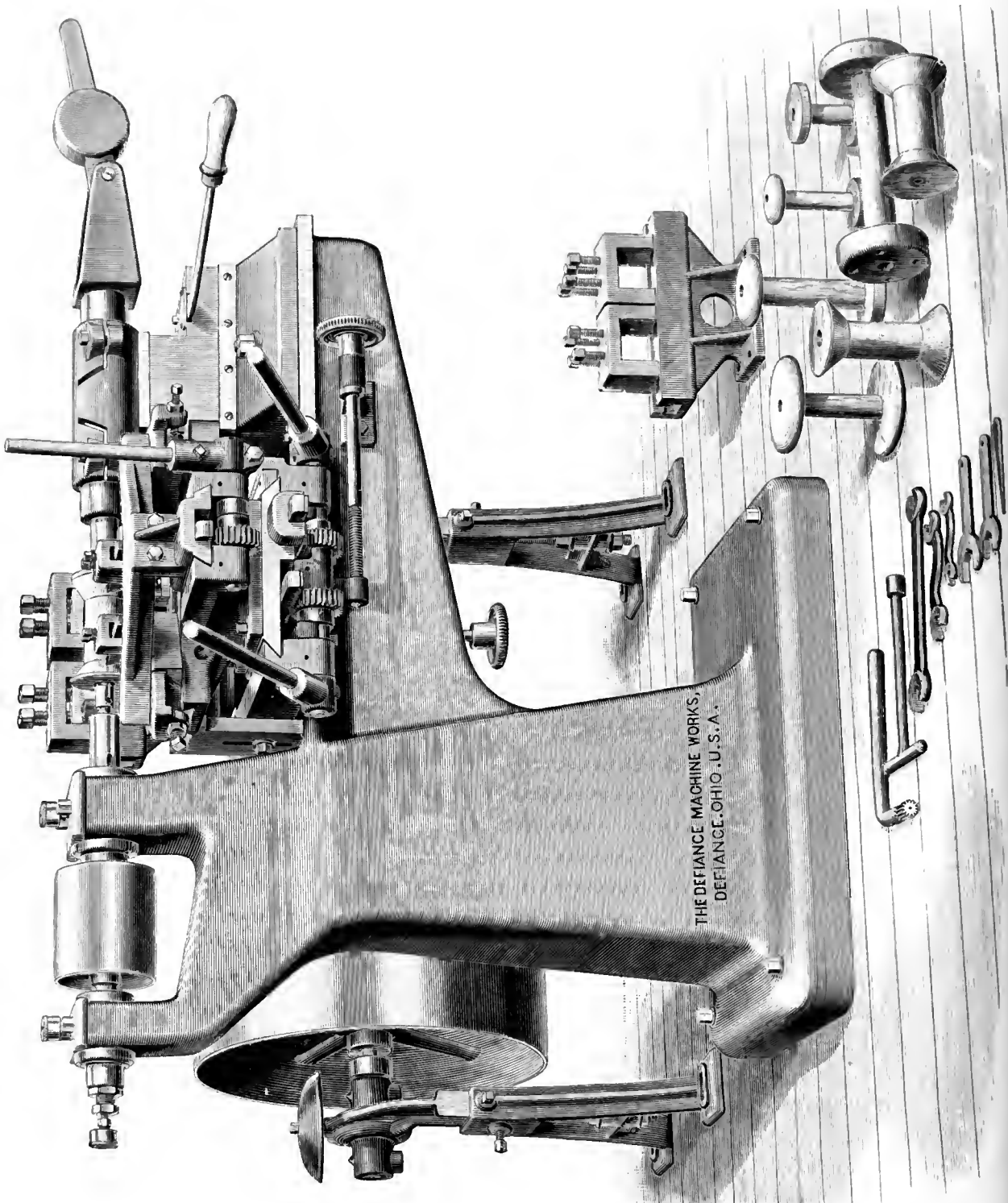
THE FRAME, of neat design, is cast in one piece, with cored center and a wide floor base to stand firm.

THE WORKING PARTS are accurately fitted to the top of the frame. The cutter head is located at the end and it is fitted to a steel spindle running in substantial, self-lubricating bearings. A shield surrounds the cutters to protect the operator. The adjustable table in front of the cutters for supporting one end of the bobbin is self-centering, always bringing the work central with the cutters without any care on the part of the operator. The other end of the bobbin is held true in a two-jawed universal chuck attached to the tail stock, which is provided with an automatic index at the rear end, to accurately space the distance between the grooves to be cut in the bobbin. The entire tail stock is adjustable horizontally on the frame to and from the cutter head, for short or long work, taking from the shortest bobbin up to 24″ at the longest.

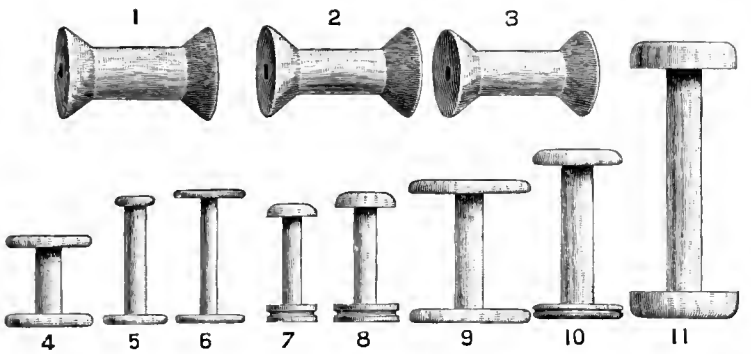
THIS MACHINE is exceedingly simple to handle. The bobbin is clamped between the jaws of the chuck, when, by a slight forward movement of the hand lever, it is moved to the cutters, when the grooving is performed, and, by a reverse movement of the lever, the bobbin is brought back, and automatically turned ready for the next cut, and so continuing until all the grooves are finished. This spacing device is absolutely correct, and it operates as quickly as the lever can be moved, thus securing a very large capacity. Any required number of grooves can be cut, according to the number of notches in the index or dial.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers, with self-oiling boxes, and fitted with our improved belt shipping apparatus; one driving pulley, $24'' \times 3\frac{1}{2}''$; one pair of tight and loose pulleys, $10'' \times 5''$, with the loose pulley fitted with bronze bearings and self-oiling device. Speed, 570 turns per minute.

HORSE POWER to drive, 1; floor space occupied, $20'' \times 48''$.



No. 1 Patent Spool Turning Lathe.



No. 1 Patent Spool Turning Lathe.

Export Shipping Weight, 2,500 Pounds.

Net Weight, 1,900 Pounds.

Cubic Measurement, 75 Feet.

Cable Word, LYNX.

THIS ENGRAVING represents our No. 1 Patent Spool Turning Lathe, especially designed for turning spools of different kinds and sizes, including the warp and taper head thread spools. It receives the spool blank, rounds the flanges, finishes the sides, and trues the barrel complete. It is furnished for turning warp spools only, or with taper head thread spool attachment, as shown by the engraving. In turning the warp spools, the tool holder shown on the floor is used in place of the one shown in the machine.

THIS MACHINE is fitted with the greatest accuraey. All the sliding surfaces are scraped to bearing. The gears and racks are cut from the solid, and bronze bearings, such as used in engine lathe construction, are employed. This, together with the substantial manner in which it is built, renders it capable of producing a large amount of perfect work.

THE FRAME, of original design, is a heavy casting in one piece, with cored center, and a broad floor base to stand firm. It is of sufficient strength to do the heaviest work in spool making, and do it entirely smooth, free from chatter marks.

THE HEAD SPINDLE, of forged steel, rotates in heavy self-lubricating bronze bearings made in halves, to take up for wear, with a bronze screw at the rear end to prevent end play. These boxes are fitted to the frame in square openings, which are scraped to fit with heavy steel plates to hold them in position.

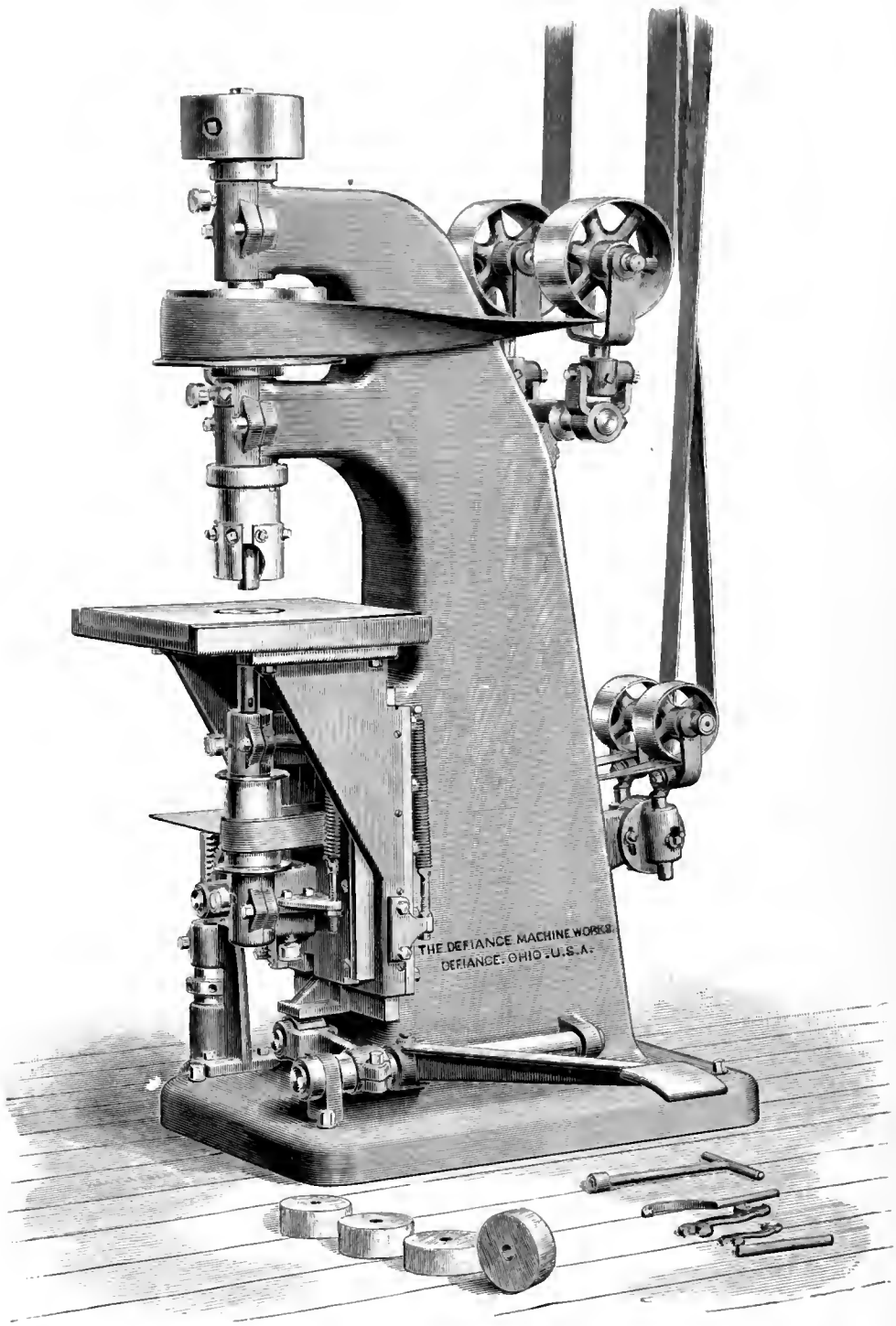
THE TAIL STOCK is fitted to the top of the frame in planed and scraped angle ways, with a horizontal adjustment on the frame to and from the head spindle for short or long work. Its spindle is provided with a quick horizontal movement by hand lever to hold or release the work between the centers and it is self-locking when thrown in either direction.

THE CARRIAGE which supports the cutters is provided with every necessary adjustment and movement to accommodate spools of every size and shape. The taper turning attachment can be quickly placed in or out of the machine by simply loosening several screws and the tool holding device for warp spools, as shown at the base of the frame, is held in the carriage by the same screws.

THE WORK to be turned is held between centers of special design, so made to center the work by the hole in the object to be turned, requiring no skill on the part of the operator to place the work into the machine correctly.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers, with improved belt shipping apparatus attached; one driving pulley, $24'' \times 6''$; tight and loose pulleys, $10'' \times 6''$; speed, 750 turns per minute.

HORSE POWER to drive, 2; floor space occupied, $34'' \times 60''$.



No. 1 Patent Spool and Bobbin Disc Cutting and Boring Machine.

Export Shipping Weight, 2,100 Pounds.

Net Weight, 1,600 Pounds.

Cubic Measurement, 55 Feet.

Cable Word, DELGOA.

No. 1 Patent Spool and Bobbin Disc Cutting and Boring Machine.

Export Shipping Weight, 2,100 Pounds.

Net Weight, 1,600 Pounds.

Cubic Measurement, 55 Feet.

Cable Word, DELGOA.

THIS ENGRAVING represents our No. 1 Patent Spool and Bobbin Disc Cutting and Boring Machine, used for cutting round wooden discs from the plank and boring a hole in the center, such as are used for making spool and bobbin heads or flanges, pulley block wheels, stool tops, and various other circular forms, including rings, which can be made by the use of special cutters. It will accommodate work 2½″ thick and under, and cut circles up to 14″ diameter and smaller. When discs are required without being bored, the boring attachment can be quickly disengaged.

THE FRAME is a heavy casting of modern design in one piece, with cored center and a wide floor base to stand firm, with all the working parts accurately fitted to it.

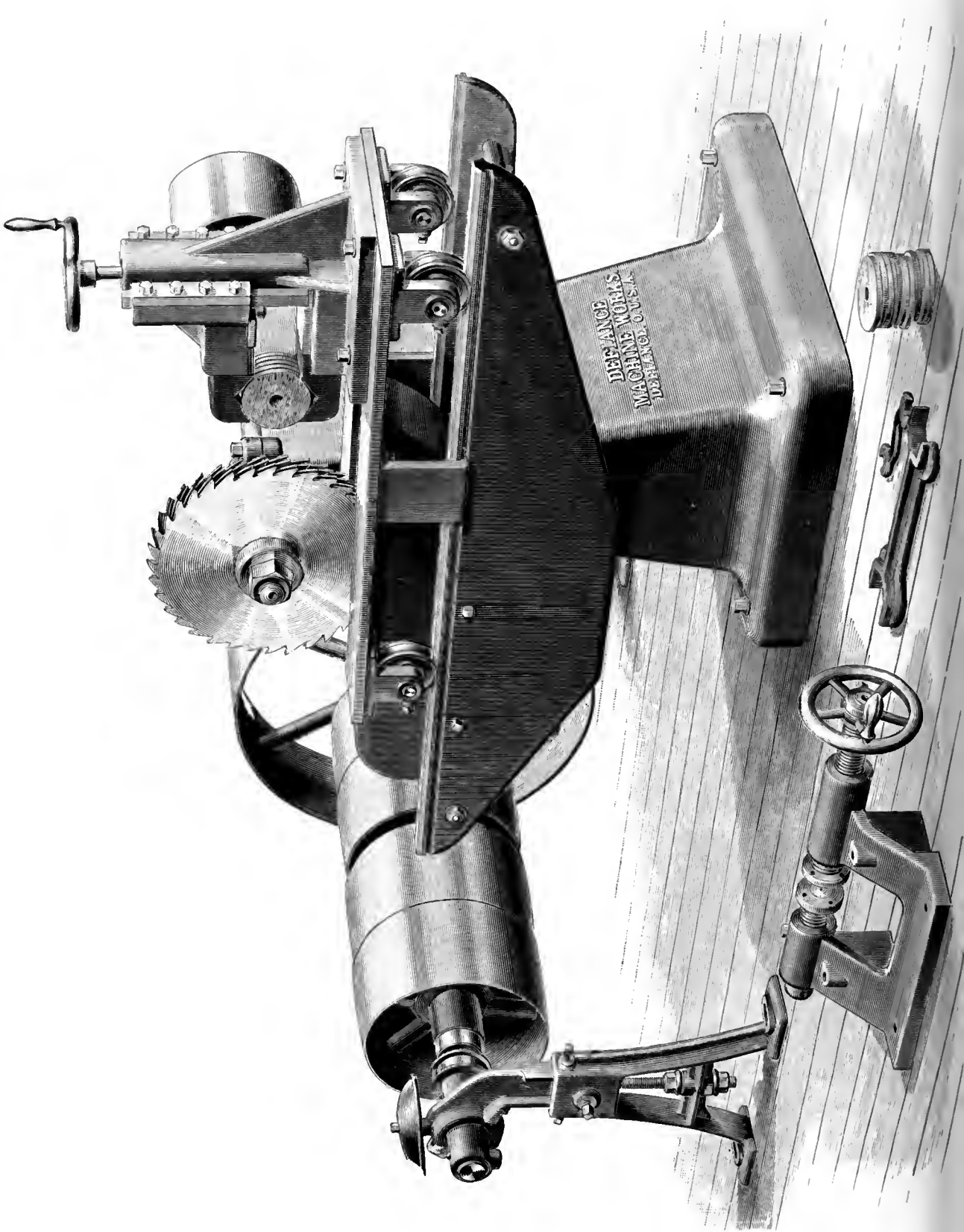
THE CUTTER HEAD SPINDLE, of steel, large in diameter, is fitted into heavy self-lubricating bearings. The cutter head used is of special design, requiring a head for each diameter of disc to be cut, and so fitted to the spindle that it can be quickly placed on or off.

THE TABLE supporting the work, with the boring attachment fitted to it, is provided with a vertical movement by foot treadle to bring the work up to the cutter head, the operator having both hands free to handle his work, enabling him to cut the discs from the plank to the best advantage, without the loss of stock, and produce about 5,000 medium-sized discs in ten hours, and other sizes in proportion. The shaping and boring of this work are both performed at the same time.

THIS MACHINE is so constructed that the discs cannot foul and get fast in the cutter head. They are firmly held against the table by a plunger until the cutter head is free from the work, when it is released. The cutting and boring are performed clean and smooth and very rapidly by unskilled labor.

THE COUNTER is furnished as follows: The shaft, $2\frac{3}{16}'' \times 72''$; two No. 2 ball and socket adjustable drop hangers, fitted with new style belt shipping apparatus; driving pulley, $18'' \times 5''$, for driving the cutter head; one driving pulley, $12'' \times 4''$, for driving the boring spindle; two pair tight and loose pulleys, for both small and large work, size $12'' \times 6''$; speed of one pair, 500 turns per minute, speed of the other pair, 1,000 turns per minute.

HORSE POWER to drive, 3½; floor space occupied, $27'' \times 45''$.


DEFIANCE
MACHINE WORKS
DEFIANCE, O. U.S.A.

No. 1 Improved Spool and Bobbin Disc Dividing Saw.

Export Shipping Weight, 2,400 Pounds.

Net Weight, 1,800 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, SAKA.

THIS ENGRAVING represents our No. 1 Improved Spool and Bobbin Disc Dividing Saw, which has been designed for the use of spool and bobbin makers for re-sawing thick wooden discs into thin sections which are used for making spool and bobbin heads or flanges in cross sections to prevent checking when they are glued together. This machine takes the work as it comes from the No. 1 Patent Spool and Bobbin Disc Cutting and Boring Machine, and prepares it for the gluing process.

IT IS provided with a gang of four 16″ saws, which are capable of re-sawing a disc of proper thickness into five sections at one operation from 2″ up to 5¾″ diameter. Larger work up to 10″ diameter can be re-sawed, providing larger saws are used. Large sized discs are usually produced with the use of a single saw in place of the gang saws, using the special attachment for holding the work, as shown at the base of the machine. From 5,000 to 10,000 pieces can be re-sawed in ten hours on this machine, the capacity depending upon the size of the work.

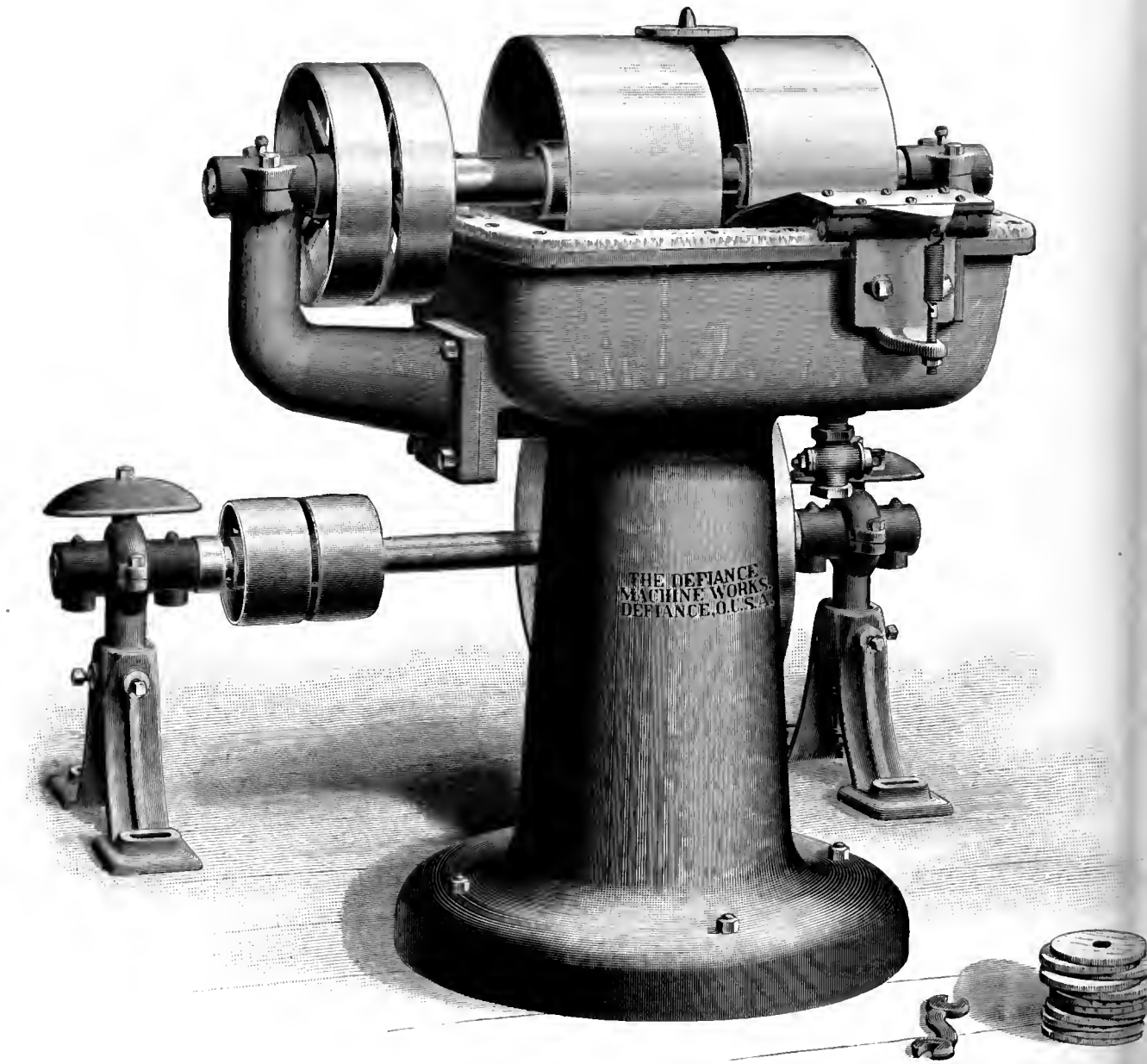
THE FRAME of this machine is a heavy casting in one piece, with cored center and a wide floor base. All the working parts are accurately fitted to it.

THE SAW ARBOR, of steel, large in diameter, runs in heavy self-lubricating bearings. The saw end is arranged to carry one or a gang of saws to suit the different kinds of work.

THE ROLLER TABLE which supports the work is gibbed and travels upon planed, angled tracks, the wheels of which are provided with roller bearings, and it works with the greatest ease to and from the saws. It is provided with stops at each end to regulate the length of travel. The chuck for holding the discs is self-centering, opening and closing by hand wheel and screw to receive discs of various sizes. The jaws consist of tool-steel plates that travel between the saws to hold each disc separately after having been re-sawed, making it impossible for the stock to get fast between the saws, and holding the work rigidly secures true work.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{15}'' \times 72''$; two No. 2 ball and socket adjustable drop hangers, fitted with new style belt shipping apparatus; one driving pulley, $30'' \times 8''$; two pairs of tight and loose pulleys, $14'' \times 8''$; speed of one pair for 16″ saw, 870 turns per minute, and the other pair, for large saws, 470 turns per minute.

HORSE POWER to drive, 6; floor space occupied, $50'' \times 56''$.



No. 1 Patent Automatic Spool Head Gluing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 29 Feet.

Cable Word, GALVANIZE.

No. 1 Patent Automatic Spool Head Gluing Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 29 Feet.

Cable Word, GALVANIZE.

THIS ENGRAVING represents our No. 1 Patent Automatic Spool Head Gluing Machine, which has been designed especially for the use of spool-makers to rapidly and correctly spread the glue over the surface of wooden discs used for building up in cross section spool heads or flanges to prevent their checking. This work is accomplished rapidly by a cheap operator by simply placing the disc over the steel pin, when the glue is uniformly spread over the surface more accurately and with less loss of glue and at an immense saving in time over the use of a brush.

IT IS constructed on a heavy iron frame with cored center and a broad floor base, with the working parts accurately fitted to it. The top of the frame consists of a hollow water case, which is provided with steam pipe connections to keep the water hot for heating the glue. The top portion of the water case is galvanized and forms a hollow receptacle in which the glue is placed and the two glue spreading drums rotate. These drums and their shaft are of solid bronze, and the glue pot being galvanized prevents corrosion. The drums travel in opposite directions to rotate the spool head, which is properly covered with glue in making a one-half rotation. From this it will be easily understood that the glue is instantly spread over the surface of the work. To each glue drum an automatic device is fitted for regulating the amount of glue to be delivered to the work.

THIS MACHINE is capable of spreading glue on discs from the smallest sizes up to 14″ diameter, handling all sizes of work at the same speed, doing the work so rapidly that the glue will not have time to set between this machine and the spool head press.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 44''$; two No. 1 ball and socket adjustable drop hangers, fitted with new style belt shipping apparatus; two driving pulleys, $6'' \times 3''$; tight and loose pulleys, $18'' \times 4''$; speed, 65 rotations per minute.

HORSE POWER to drive, ½; floor space occupied, $27'' \times 29''$.

No. 1 Improved Spool Head Gluing Press.

Export Shipping Weight, 2,600 Pounds.
Net Weight, 2,000 Pounds.
Cubic Measurement, 92 Feet.
Cable Word, PRINCE.

No. 1 Improved Spool Head Gluing Press.

Export Shipping Weight, 2,600 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 92 Feet.

Cable Word, PRINCE.

THIS ENGRAVING represents our No. 1 Improved Spool Head Gluing Press, designed for the use of spool manufacturers to press the spool discs or flanges together after they have been provided with glue on our No. 1 Automatic Spool Head Gluing Machine. They are companion machines and should be used together, as they have the same capacity and one operator should handle both machines.

THIS MACHINE differs in construction from any other press heretofore offered for the purpose, and it is much more powerful. It is capable of exerting a pressure of 60,000 pounds, which is necessary in order to make thoroughly tight glue joints to prevent them from springing apart after they are fitted to the spool. If the stock from which they are made is seasoned and these machines are employed no open glue joints will be found, while previous to the introduction of our machines, defective joints proved a serious loss to the spool-makers.

THE CAPACITY of this machine is exceedingly large and will accommodate work up to 12″ diameter. As fast as the glue is put on to the spool head discs they are, at one handling by the operator of the gluing machine, slipped over a steel spindle which will accommodate a sufficient number of discs to fill a space 34″ long, or shorter. When the spindle has been filled with discs they are placed into this machine and pressed up tightly to their proper place. Then with the pressure on, a key is placed behind a collar through a hole in one end of the shaft and locked in position. The screw in the press is then reversed, which releases the work from the machine. The spindle with the discs clamped between the collars is then taken from the machine and set to one side to dry and set, and the operation is then repeated. The number of disc spindles necessary will depend upon the capacity required.

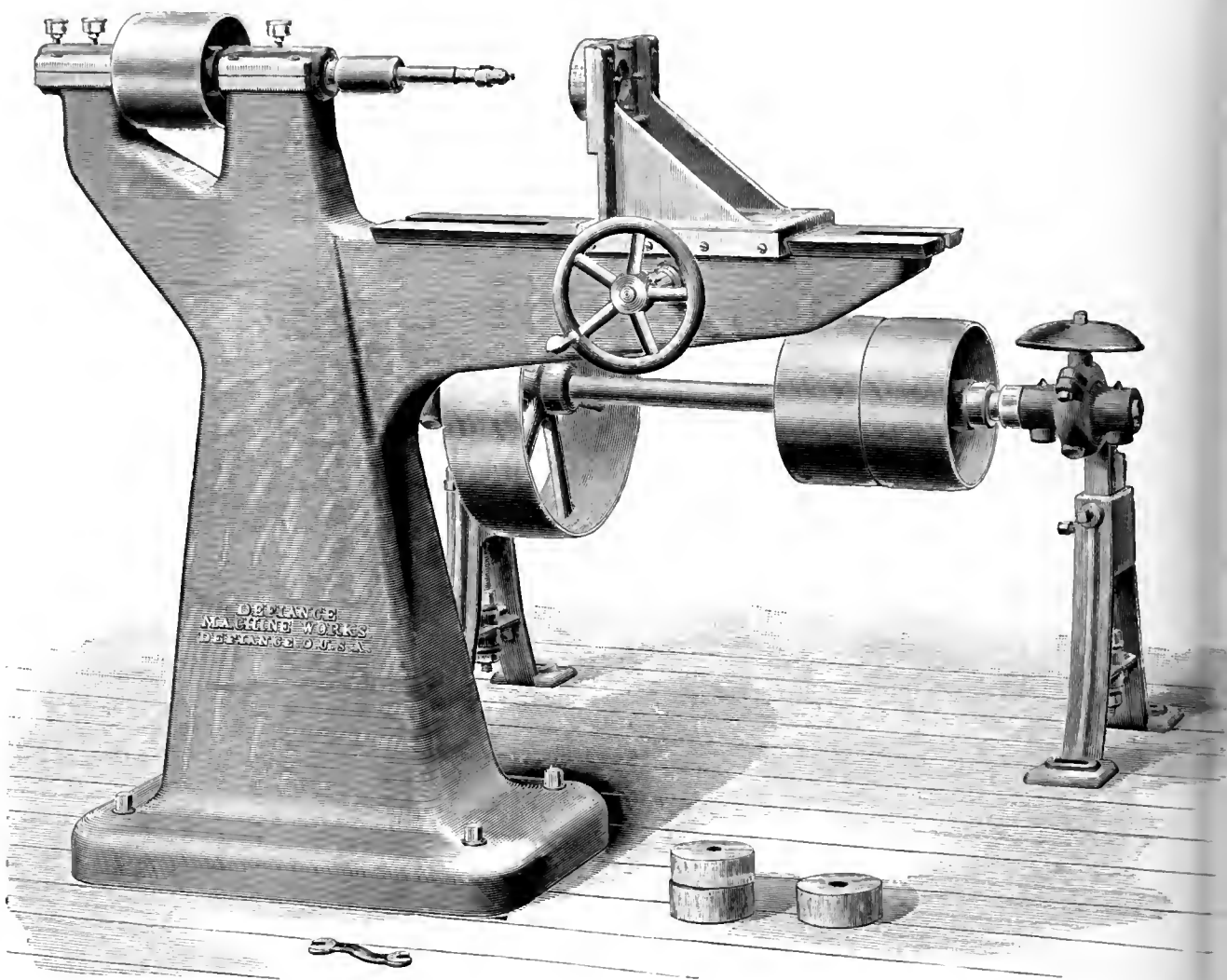
THE FRAME of this machine is of modern design, cast in one piece, with cored center, and of sufficient strength to do the work with ease, without injury to the working parts.

THE SCREW, of steel, 4″ in diameter, is driven by a powerful double friction clutch in connection with heavy cut gearing. By a slight touch of the friction lever convenient to the operator the screw can be run in either direction. The frictions are fitted with an automatic brake, so that the operator has complete control over the machine from the working side, starting or stopping instantly and securing any amount of pressure required, depending upon the nature of the work.

THE TAIL STOCK, against which the pressure is applied, is thoroughly gibbed to the top of the frame and it can be adjusted horizontally on the frame for short or long work. A heavy steel pin fits through it and the bed into reamed holes. A number of holes are provided for various adjustments. All the working parts of this machine are accurately fitted with sliding surfaces scraped to bearing, and the working parts are exceedingly large and strong.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 52''$; two No. 2 ball and socket adjustable drop hangers, with new style belt shipping apparatus; two driving pulleys, $10'' \times 4''$; tight and loose pulleys, $10'' \times 4''$; speed, 405 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, $20'' \times 111''$.



No. 1 Improved Spool Head Re-Boring Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 30 Feet.

Cable Word, BOONEBRIAR.

No. 1 Improved Spool Head Re-Boring Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 700 Pounds.
Cubic Measurement, 30 Feet.
Cable Word, BOONEBRIAR.

THIS ENGRAVING represents our No. 1 Improved Spool Head Re-Boring Machine, which is used by spool and bobbin makers for re-boring the hole in spool and bobbin heads or flanges, and preparing them for the tapping machine to receive the threads, or for plain holes where no threads are used. When these heads or discs are cut out from the plank a small hole is bored in them at the same time to fit over the gluing spindle used on the glue press, and after they are glued together the holes do not always agree with each other, and for this reason re-boring is necessary to secure accurate work.

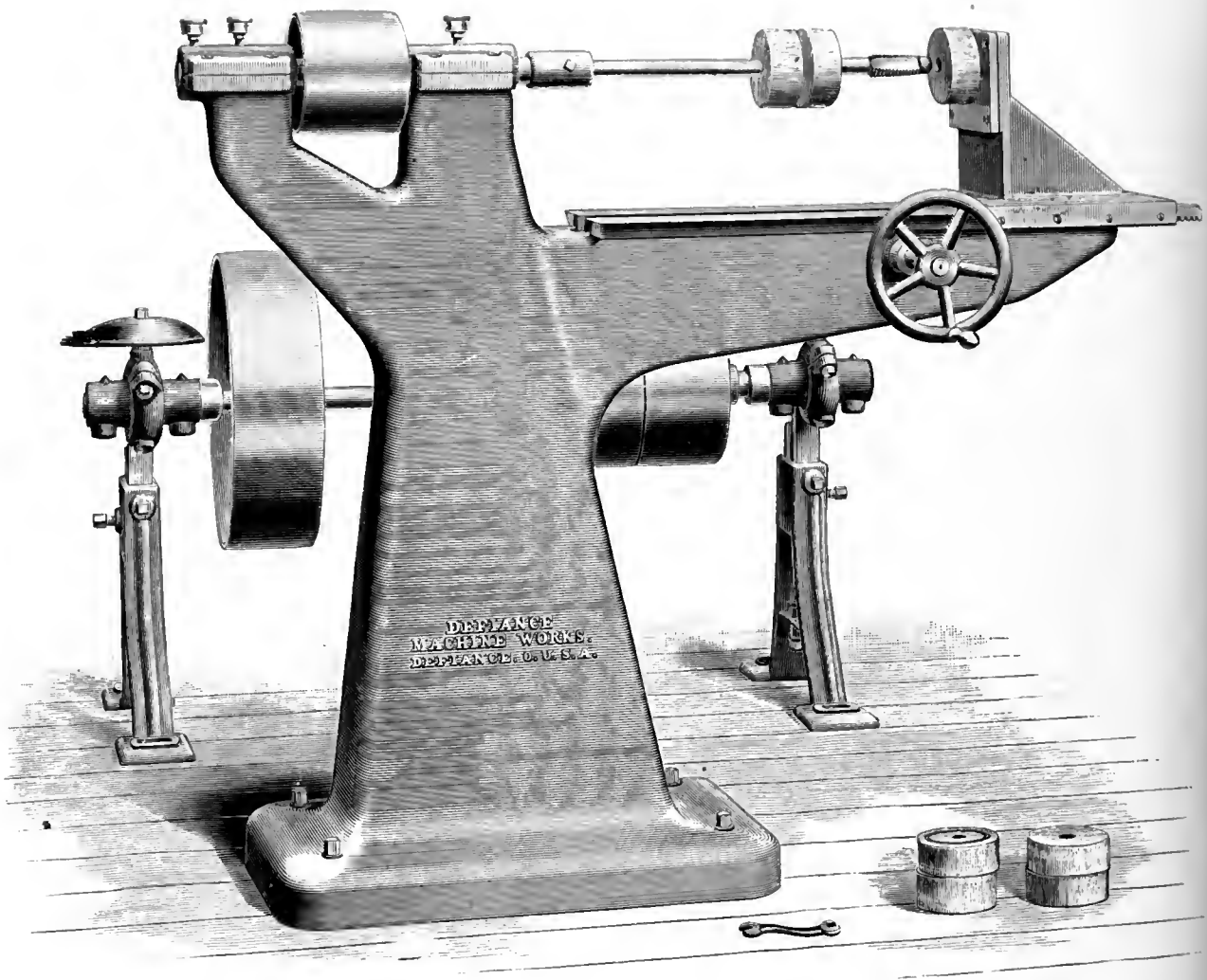
THE FRAME of this machine is well designed and very strong. It is cast in one piece, with cored center and a broad floor base to stand firm. The extended arm to which the carriage is fitted enables the operator to stand close to his work with no interference at the base of the frame.

THE BORING SPINDLE, of steel, rotates in large genuine babbitt metal self-lubricating bearings. The cutter bar is fitted with an improved double-ended cutter held in position by a single screw. A cutter is required for each sized hole to be bored. It is provided with shear-cutting edges and it will bore smooth and true. No skill on the part of the operator is required in changing the cutters, as they are self-centering. They are inexpensive, being made from a flat piece of tool steel.

THE CARRIAGE for holding the work while boring is gibbed to the frame in angle ways, and it is moved to and from the cutter with the greatest ease by a slight movement of the hand-wheel. About 5,000 discs can be re-bored with this machine in ten hours.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers, with new style belt shipping apparatus attached; one driving pulley, $18'' \times 5''$; tight and loose pulleys, $10'' \times 5''$; speed, 450 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $18'' \times 51''$.



No. 1 Improved Spool Head Tapping Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 30 Feet.

Cable Word, TOURING.

No. 1 Improved Spool Head Tapping Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 700 Pounds.
Cubic Measurement, 30 Feet.
Cable Word, TOURING.

THIS ENGRAVING represents our No. 1 Improved Spool Head Tapping Machine, which has been designed for cutting threads in spool heads and preparing them for the spool barrels. It can also be used with equal success for tapping threads in bobbin flanges, brush blocks, hand clamps, and various other wooden articles. It performs the work very rapidly and accurately with an unskilled operator to handle it.

THE FRAME of this machine is a neat casting in one piece, with cored center and a wide floor base, with the working parts accurately fitted to it. The projecting arm which supports the carriage enables the operator to stand close up to his work, as the portion of the floor occupied by the operator is entirely disencumbered.

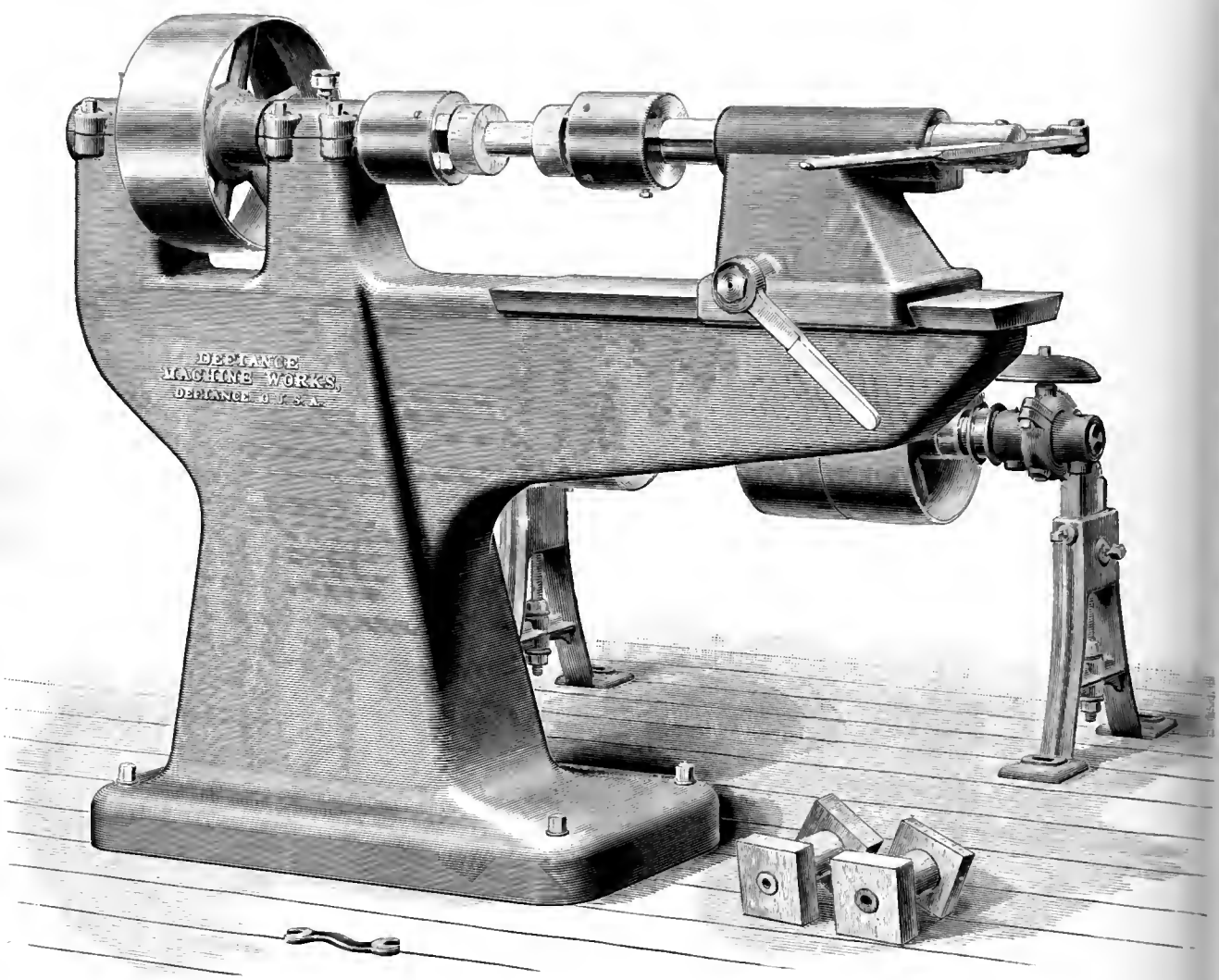
THE SPINDLE of steel runs in long genuine babbitt metal self-lubricating bearings, with the driving pulley between them. The projecting end of the spindle receives the tap, which is held in position by a single screw so that it can be placed in or out of the machine quickly.

THE CARRIAGE supporting the work is gibbed to the top of the frame in angular ways, and provided with a horizontal movement by a hand-wheel in connection with cut pinion and rack. The work to be tapped is simply held against four steel pins attached to the upright portion of the carriage, and in this position it is fed to the tap by turning the hand-wheel. After the work is tapped it is released from the carriage and remains on the shank of the tap, and the operation is repeated until the entire length of the tap is filled up, when it is removed from the machine and the finished product slipped off the back end of the tap ready to be refilled.

THE TAP is furnished to cut any number of threads per inch required, and it is supplied with a long shank to hold a large number of finished pieces at one time.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers, with improved belt shipping apparatus attached; one driving pulley, $18'' \times 5''$; tight and loose pulleys, $10'' \times 5''$; speed, 200 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $18'' \times 51''$.



No. 1 Improved Spool and Bobbin Screwing Press.

Export Shipping Weight, 1,900 Pounds.

Net Weight, 1,400 Pounds.

Cubic Measurement, 41 Feet.

Cable Word, PRIZO.

No. 1 Improved Spool and Bobbin Screwing Press.

Export Shipping Weight, 1,900 Pounds.

Net Weight, 1,400 Pounds.

Cubic Measurement, 41 Feet.

Cable Word, PRIZO.

THIS ENGRAVING represents our No. 1 Improved Spool and Bobbin Screwing Press, especially designed for screwing the heads or flanges on spool and bobbin barrels, doing the work rapidly and accurately, with unskilled labor. This machine, like our other spool and bobbin tools, has such a large capacity that one operator can handle several of them.

THIS MACHINE screws both heads or flanges at the same time, setting them up tightly against the shoulders. The operator having complete control over the machine secures the exact amount of power required for light or heavy work. The power can be instantly released by a slight movement of a lever, thus overcoming the liability of injuring the work.

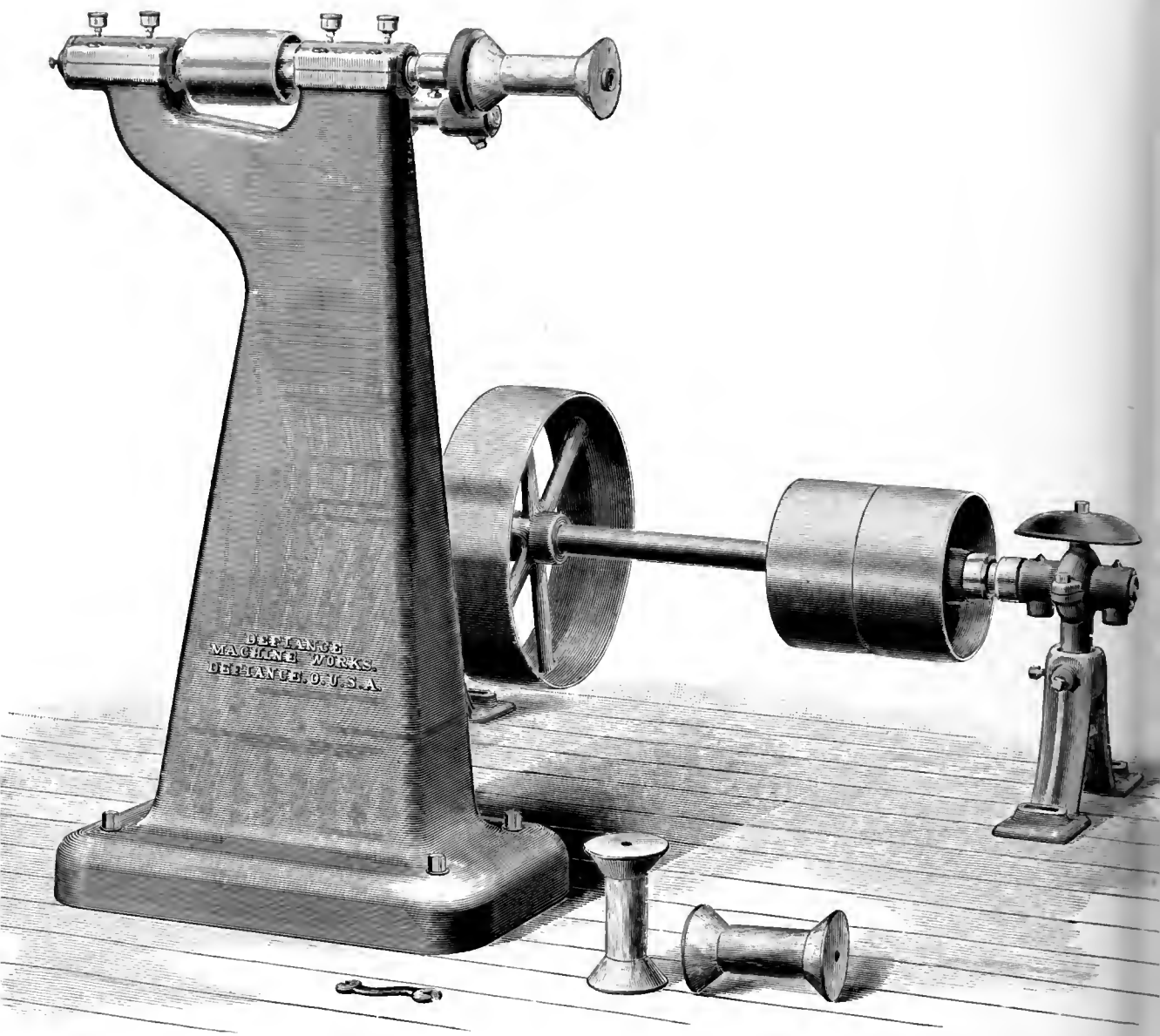
THE FRAME of this machine, of neat design, is cast in one piece, with cored center, and a wide floor base to stand firm. The projecting arm, to which the tail stock is fitted, enables the operator to stand close up to his work.

THE HEAD SPINDLE, of steel, rotates in heavy self-lubricating bearings and it is fitted with tool-steel spurs for holding and driving the work of different sizes.

THE TAIL STOCK has a horizontal adjustment to or from the headstock for short or long work, and its spindle is also provided with driving spurs; it has a quick lever adjustment to bring both driving heads up to the work, and instantly release the work when the flanges are screwed against the shoulders. The operator, having one hand on the work, the other on the lever, is able to judge instantly when sufficient power has been applied.

THE COUNTER is furnished as follows: Shaft, $1\frac{5}{16}'' \times 48''$; two No. 2 ball and socket adjustable drop hangers, with new style belt shipper; one driving pulley, $10'' \times 6''$; tight and loose pulleys, $12'' \times 6''$; speed, 280 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, $20'' \times 67''$.



No. 1 Improved Spool and Bobbin Facing Machine.

Export Shipping Weight, 700 Pounds.

Net Weight, 550 Pounds.

Cubic Measurement, 14 Feet.

Cable Word, FINNO.

No. 1 Improved Spool and Bobbin Facing Machine.

Export Shipping Weight, 700 Pounds.

Net Weight, 550 Pounds.

Cubic Measurement, 14 Feet.

Cable Word, FINNO.

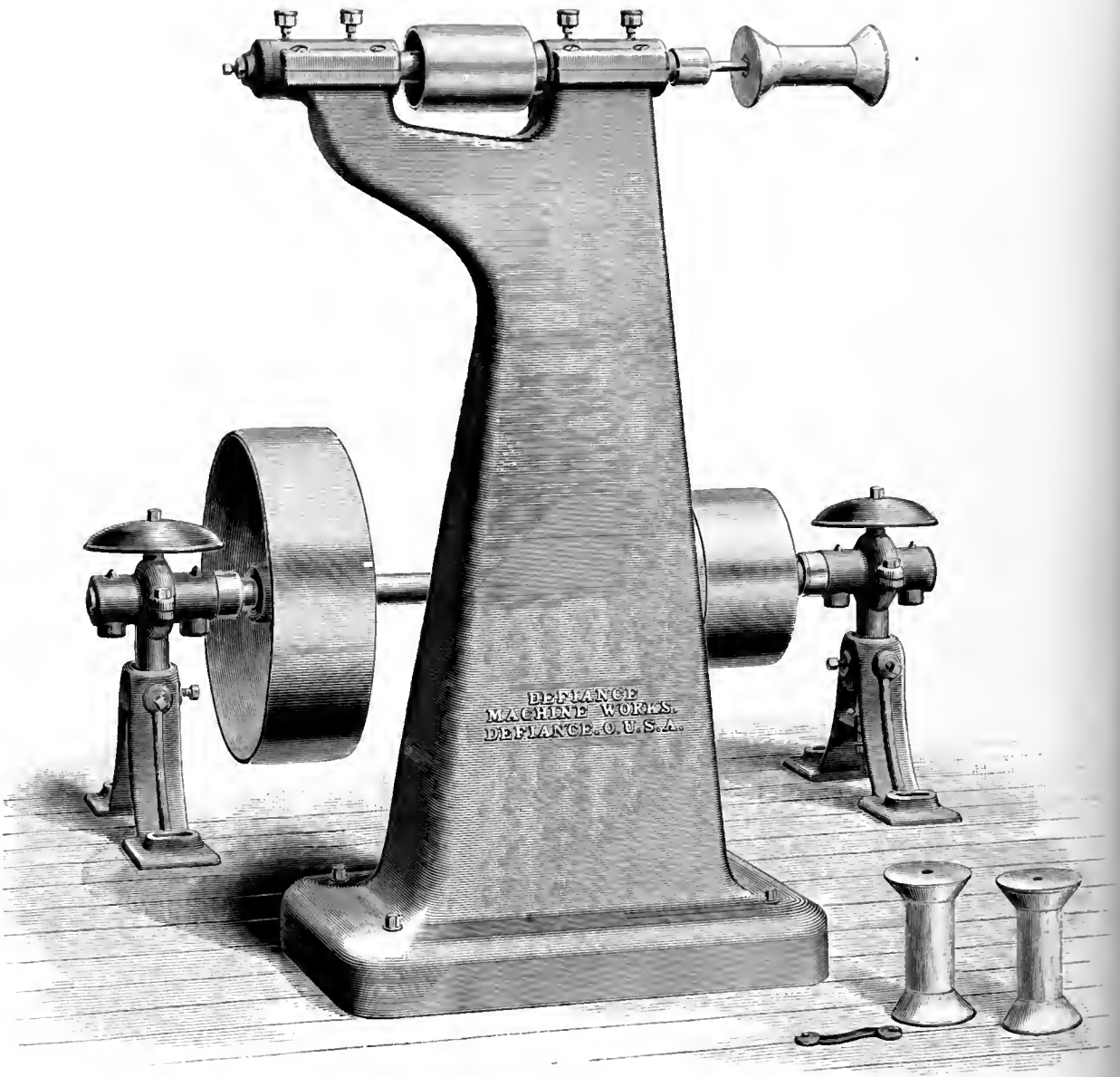
THIS ENGRAVING represents our No. 1 Improved Spool and Bobbin Facing Machine, especially designed for the use of wood turning concerns to remove the stub end on spools, bobbins, handles, and other turned work, which is left by the turning lathe. By this machine and a cheap operator the ends of turned work can be faced smooth and true with the turning at the rate of about 10,000 pieces per day, and no further finishing is necessary.

THE FRAME of this machine is a substantial casting in one piece, with cored center and a wide floor base to stand firm, free from vibration when running, which is essential for smooth work.

THE CUTTER HEAD SPINDLE, of steel, runs in long self-lubricating genuine babbitt metal bearings, adjustable to take up in every direction for wear, with the facing cutter attached to the end overhanging the frame to give the operator easy access to his work. The object to be faced off is slipped over a guide pin and centered true with the facing cutter without any care on the part of the operator, and pushed forward until the face-plate is reached when the cutting ceases and the work is completed. The face-plate is true with the cutter so that the facing must always be true with the turning. A horizontal adjustment is provided with the face-plate, or guide, to regulate the depth of cut. By the use of a suitable cutter this machine will face straight over, convex or concave, or cup a recess with square or round shoulders, and it can also be used for cutting tenons and other small work of this description. All the parts of this machine are fitted up with the greatest care.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 44''$; two No. 1 ball and socket adjustable drop hangers, with new style belt shifter attached; one driving pulley, $24'' \times 5''$; tight and loose pulleys, $10'' \times 5''$; speed, 650 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $15'' \times 44''$.



No. 1 Improved Spool and Bobbin Polishing Machine.

Export Shipping Weight, 700 Pounds.

Net Weight, 550 Pounds.

Cubic Measurement, 14 Feet.

Cable Word, PEXTO.

No. 1 Improved Spool and Bobbin Polishing Machine.

Export Shipping Weight, 700 Pounds.

Net Weight, 550 Pounds.

Cubic Measurement, 14 Feet.

Cable Word, PEXTO.

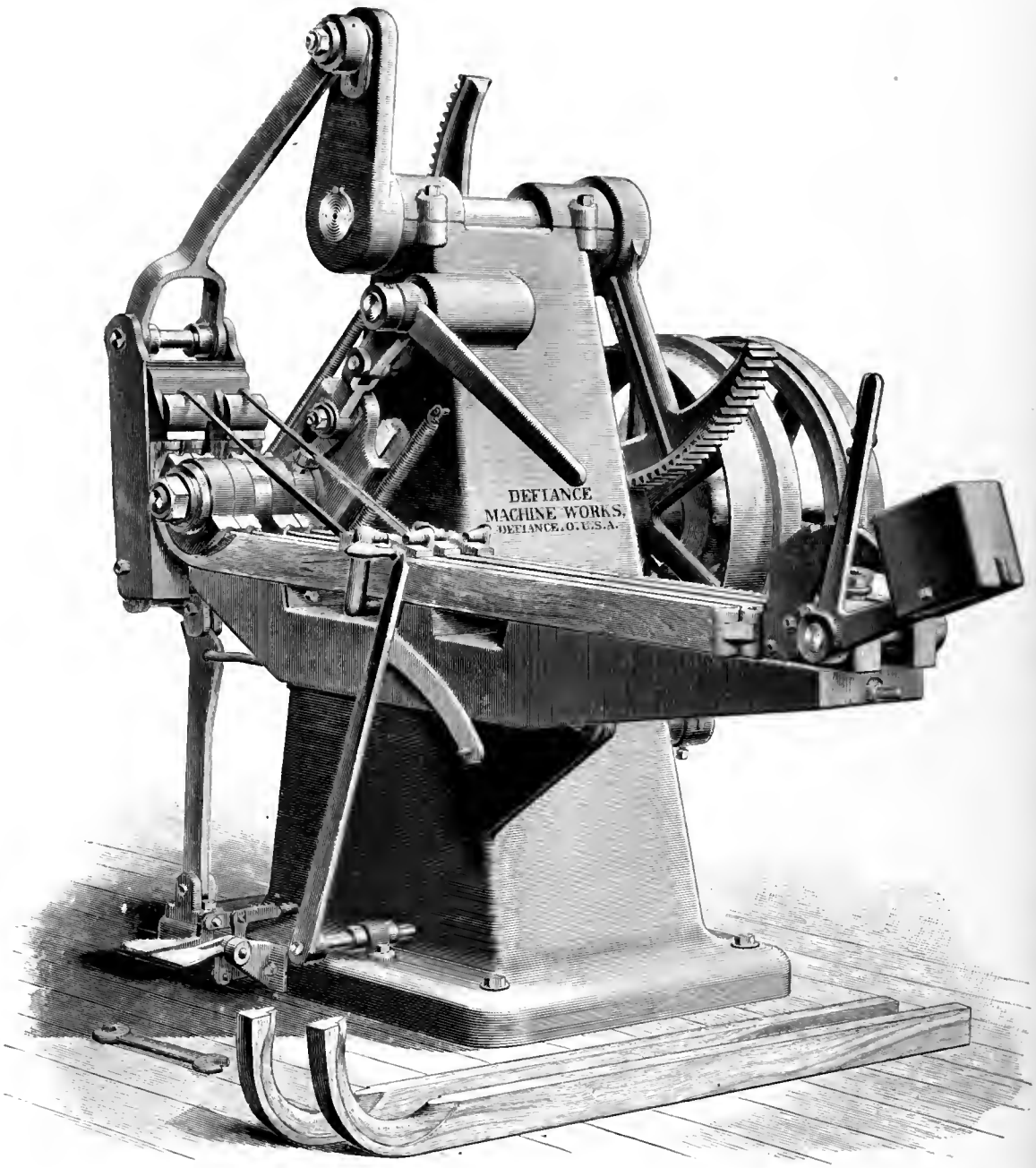
THIS ENGRAVING represents our No. 1 Improved Spool and Bobbin Polishing Machine, which has been designed to rapidly and accurately polish spools, bobbins, etc., after leaving the turning lathe, and preparing them for the market. This same machine can be used as well for painting and varnishing this class of work by running the machine at a lower speed. The work to be polished is slipped on to the steel spindle while in operation, and when finished it is removed without stopping the machine. Consequently a large amount of work can be secured with a cheap operator. A spindle is used for each size of hole in the work to be polished, and these spindles can be quickly placed in or removed from the machine by loosening a single screw.

THE FRAME, of neat design, is cast in one piece, with cored center and a broad floor base to stand firm. The polishing spindle overhangs the frame so that the operator can stand close up to the work and easily reach every portion of it without changing his position.

THE SPINDLE, of steel, is fitted into long self-lubricating genuine babbitt metal bearings, provided with adjustments to take up for wear in either direction. It is necessary to have the spindle run true, entirely free from vibration, in order to secure satisfactory results. With this machine a large amount of perfect work can be secured at a low cost.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 44''$ long; two No. 1 ball and socket adjustable drop hangers; one driving pulley, $24'' \times 5''$; tight and loose pulleys, $10'' \times 5''$; speed, 400 turns per minute.

HORSE POWER to drive, ½; floor space occupied, $15'' \times 44''$.



No. 1 Patent Automatic Plow Handle Bending Machine.

Export Shipping Weight, 4,200 Pounds.

Net Weight, 3,300 Pounds.

Cubic Measurement, 215 Feet.

Cable Word, BELOIT.

No. 1 Patent Automatic Plow Handle Bending Machine.

Export Shipping Weight, 4,200 Pounds.

Net Weight, 3,300 Pounds.

Cubic Measurement, 215 Feet.

Cable Word, BELOIT.

THIS MACHINE has been designed espeeially for bending plow handles. It is, however, equally well adapted to the bending of hockey sticks and other shapes on the end of wood to a half or a lesser circle. It is calculated to bend four handles at one operation, and to produce 3,000 handles per day, and perform the work successfully without breaking or buckling the timber. To reduce labor and save material and to insure accuracy are the objects of this machine, and extraordinary indeed is the high degree of effieiency with which these objects are secured.

THE MAIN FRAME is constructed of iron, a massive casting in one piece, with cored center, of great strength to withstand the heaviest classes of bending.

THE FORMS over which the handles are bent are made of bronze to prevent corrosion, and they are fitted to a heavy steel shaft, which is attached to a sliding head, and by means of a hand lever the forms are brought down upon the handles to hold them in proper position upon the table; a pair of foot treadles located at the base of the frame connects with the driving power for running the bending head up and down; the weight of the operator's foot upon one of the treadles instantly starts the machine and bends the handles around the forms: after the bend is completed and the shackles attached to the handles to hold the bend, the operator's foot is applied to the second treadle, and the bending head retreats; the forms are then lifted from the handles and held up out of the way by spring balances; the bent handles can then be quickly removed from the machine without loosening a screw or disconnecting any of its parts.

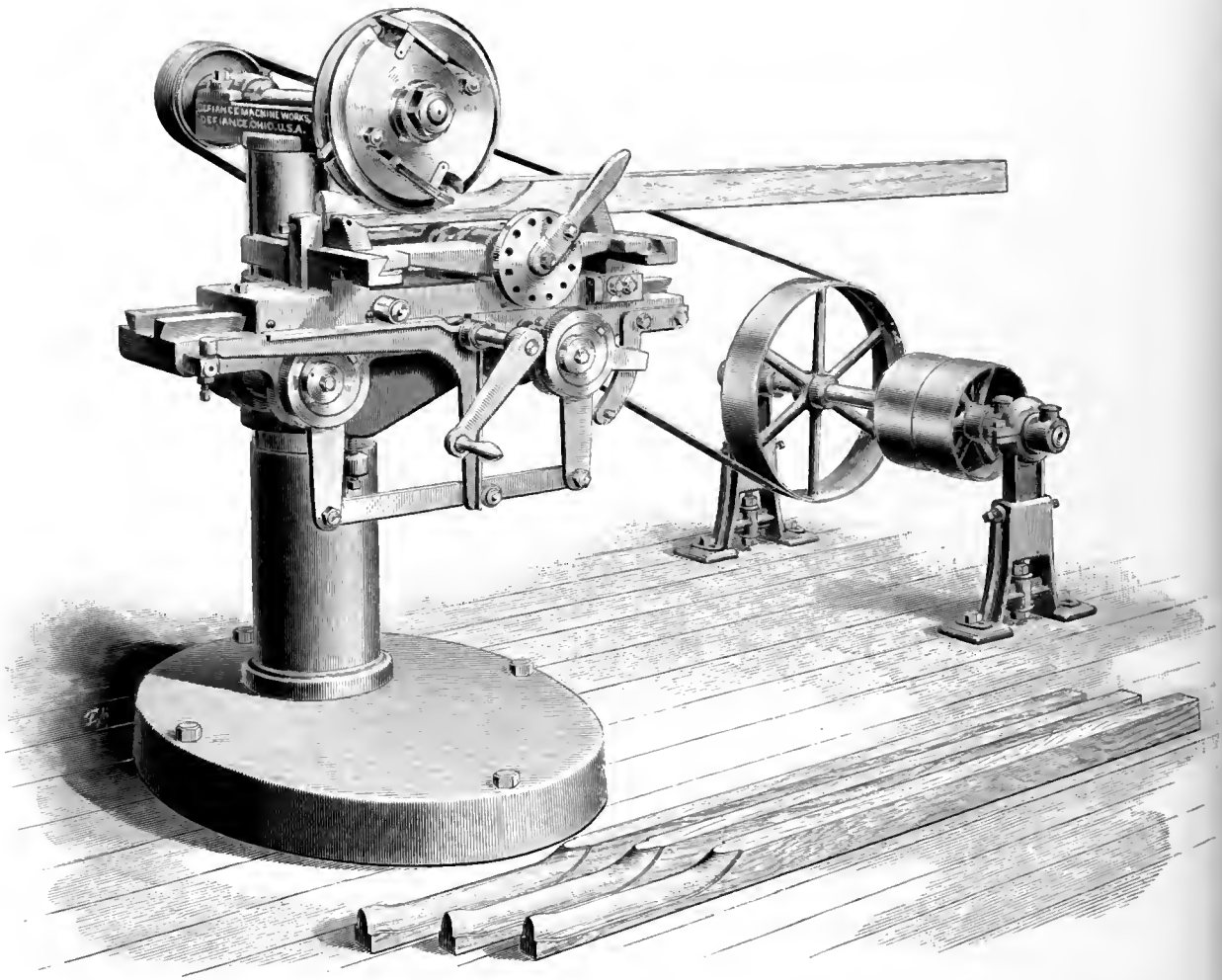
THE BENDING HEAD is fitted with a steel master strap, and when down forms a level table upon which the bender straps are laid to receive the straight timber. The bender straps are provided at each end with heel castings by which to attach the shackles; it requires two straps and shaekles for each batch of timber bent, and they must be left on the bent handles after they have been taken from the maehine until the timber is cold and thoroughly set, so as not to spring out of shape when the shackles and straps are removed.

THE MATERIAL TO BE BENT should be equalized to exact length, and the portion which is to form the inside of the bend is rounded or shaped to correspond with the shape of the bender forms by a special maehine built for that purpose. The end to be bent should be thoroughly softened, either by steaming or soaking in hot water before being bent.

A DOUBLE FRICTION COUNTER instantly starts or stops the machine without shifting a belt, free from shock or jar, the operator having complete control over the machine from the working side. Two friction belt pulleys are employed, one 24″ diameter, 4″ face, for running the bending head up, and it is driven by a straight belt 12 rotations per minute; the other pulley is 24″ diameter, 2″ face, running 12 rotations per minute in the opposite direction, and driven by a crossed belt. For running the bending head down two pulleys are required on the main line, of equal diameter, with 2″ and 4″ crowning faces.

A COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 42''$; two No. 2 hangers; one pulley $36'' \times 3''$, one $6'' \times 4''$, and one $6'' \times 2''$; no shipper; speed, 48 rotations per minute.

HORSE POWER to drive, $1\frac{1}{2}$; floor space occupied, $55'' \times 66''$.



No. 1 Improved Inside or First Plow Handle Shaper.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 50 Feet.

Cable Word, SYLVESTER.

No. 1 Improved Inside or First Plow Handle Shaper.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 50 Feet.

Cable Word, SYLVESTER.

THIS ENGRAVING represents an improved machine used by the manufacturers of plow handles to shape or round the portion of the plow handle which is to form the inside of the bend.

THIS WORK is the first operation upon the handle, the material is then in the form of a straight stick, and after the rounding is finished the handle is then placed into the bending machine and the end bent to the proper circle.

THE BODY of the machine is of neat design, strongly constructed of a hollow column provided with a broad base to stand firm.

THE CUTTER HEAD is fitted upon a heavy steel spindle running in genuine babbitt metal self-lubricating bearings, and it is supplied with four knives, their cutting edges semicircular in form, and each knife is provided with a chip breaker. Its construction is such that it will work against the grain of the material and cut perfectly smooth, leaving a fine, clean finish at the terminus of the cut.

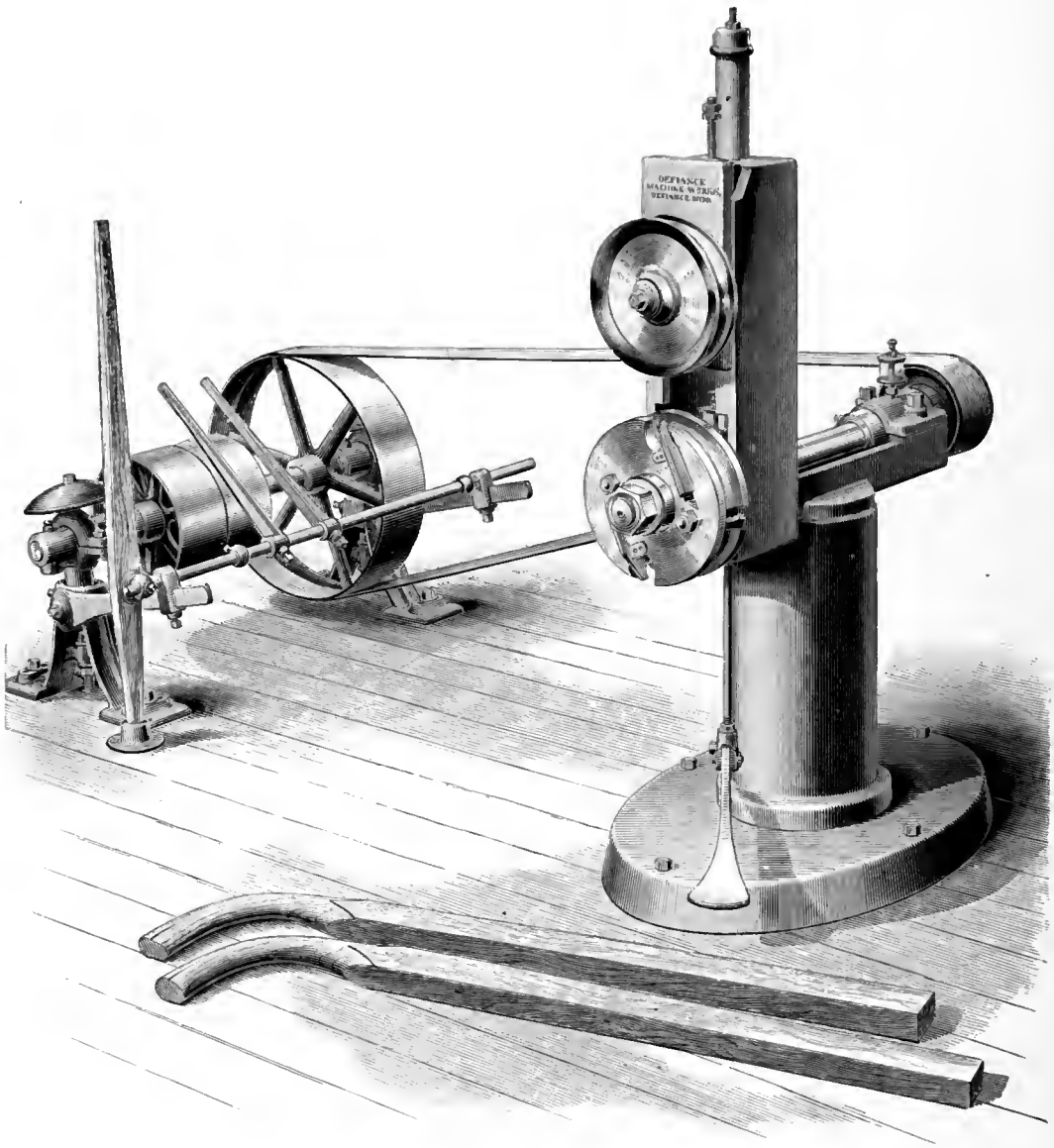
THE TABLE is accurately fitted to the main column of the machine, having a vertical adjustment to regulate the depth of cut, and it slides in a horizontal plane by rack and pinion movement, having adjustable stops for regulating the length of the cut. A universal chuck is mounted upon the sliding carriage which grips the handle while being operated upon.

THE HANDLE is held by a double grip consisting of jaws impelled by right and left hand screws. By turning a single lever the material is firmly held in position, and with a single movement of the sliding carriage the operation is completed, when the handle is ready for the bending and finishing process.

IT WILL shape 3,000 handles per day and do the work perfectly with cheap labor to operate.

THE COUNTER consists of two No. 2 hangers; shaft, $1\frac{15}{16}'' \times 48''$ long; driver, $30'' \times 4''$; tight and loose pulleys, $12'' \times 6''$; speed, 500 rotations per minute; pulley on cutter head spindle, $7'' \times 3\frac{1}{2}''$; speed, 2,100 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, $36'' \times 41''$.



No. 2 Improved Second or Outside Plow Handle Shaper.

Export Shipping Weight, 700 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 25 Feet.

Cable Word, SHADOW.

No. 2 Improved Second or Outside Plow Handle Shaper.

Export Shipping Weight, 700 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 25 Feet.

Cable Word, SHADOW.

THIS MACHINE, as shown by the engraving, is used by the makers of plow handles to shape the outer arc of the bent portion of the handle, and it is the first operation upon the handle after leaving the bending machine.

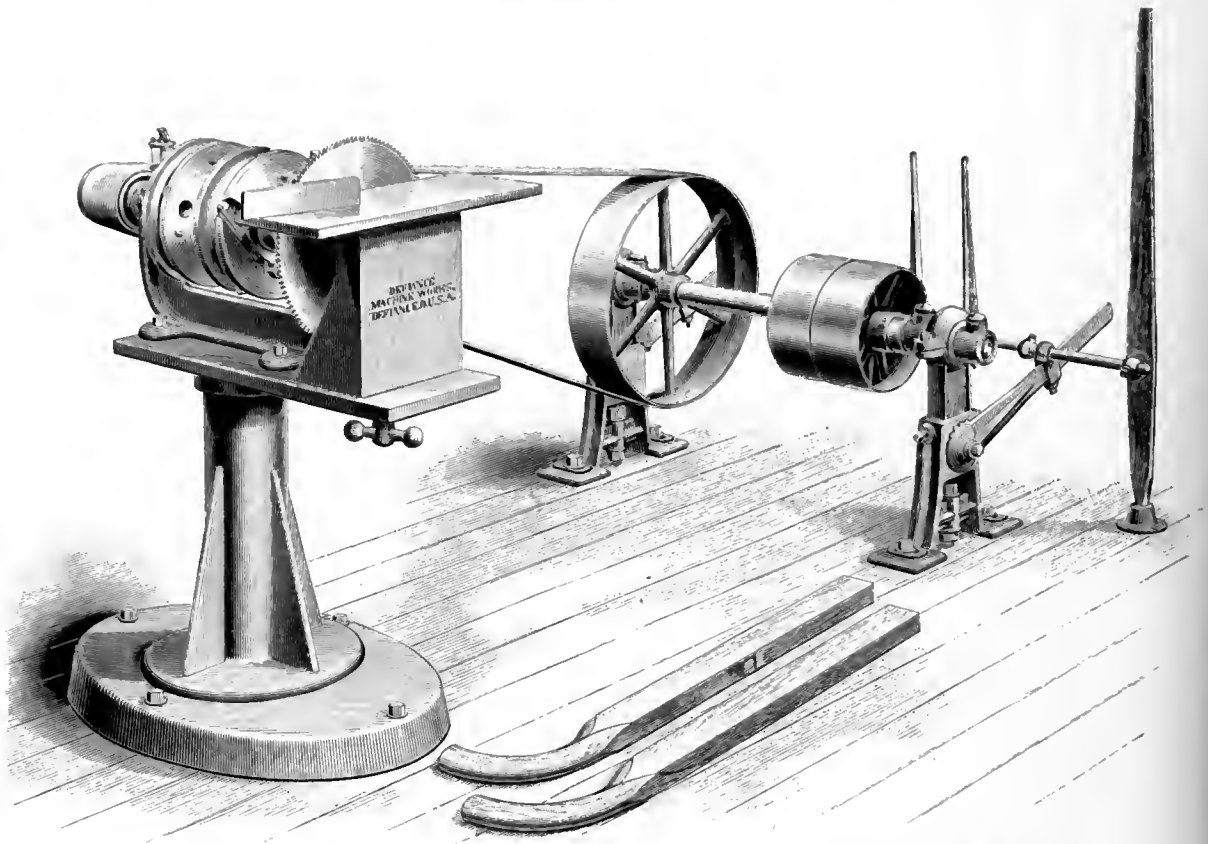
THE FRAME, of iron, is cast with cored center and it is very stiff and reliable with a broad base.

THE CUTTER HEAD is of the same general character as that used on the first or inside shaper and is easily kept in order, having adjustable cutters with chip breakers. The grooved roller above the cutter head is a guide, into the groove of which the handle to be shaped is hooked, with the bend upward, and the shaft, or straight portion of the handle, in nearly a horizontal position. By means of the foot treadle the handle is brought down into contact with the cutter head, and by the operator's hands the straight part or body of the handle is brought upward to nearly a perpendicular position, taking care to keep the crook securely seated in the groove of the guide roller.

A SINGLE PASS of the handle through this machine completes the rounding of the outside of the bent portion. 3,000 handles can be easily put through this operation per day.

A COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 48''$; two No. 2 hangers; driver, $30'' \times 4''$; tight and loose pulleys, $10'' \times 5''$; speed, 480 rotations per minute; pulley on cutter head spindle, $6'' \times 3\frac{1}{2}''$; speed, 2,400 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, $26'' \times 36''$.



No. 3 Improved Plow Handle Dressing and Cut-Off Machine.

Export Shipping Weight, 500 Pounds.
Net Weight, 300 Pounds.
Cubic Measurement, 20 Feet.
Cable Word, SANDOW.

THIS ENGRAVING represents an improved machine used by plow handle makers for cutting off a small surplus from the bent end of handles, trimming them to proper angle and length. It is necessary in bending handles of this kind to leave a small surplus to prevent fracturing.

THE TWO CUTTER HEADS on the saw arbor are used for dressing off any imperfections in the bend of handles that may be sustained while the bend is being performed, as occasionally an imperfect piece of material when bent will show a slight kink or buckle in the bend, and by the aid of these heads the handles can be redressed and saved; also for removing a small fin or rib in the center of the outside bend, which is left by the Second or Outside Plow Handle Shaper.

THE HANDLE is held in the hands during all three operations for which this machine is designed, and it is capable of redressing 3,000 handles per day.

THE BODY of the machine is of neat design and strongly constructed of a hollow column provided with a substantial base.

THE CUTTER HEADS and saw are fitted to a heavy steel spindle and the knives are provided with chip breakers to work the material smooth without tearing.

A COUNTER is furnished as follows: Shaft, $1\frac{1}{8}'' \times 42''$ long; two No. 1 hangers; driver, $24'' \times 4''$; tight and loose pulleys, $12'' \times 5''$; speed, 400 rotations per minute; pulley on cutter head spindle, $4'' \times 4''$; speed, 2,400 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, $24'' \times 36''$.

No. 1 Improved Revolving Plow Handle Sand Belting Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,000 Pounds.
Cubic Measurement, 33 Feet.
Cable Word, PLENTY.

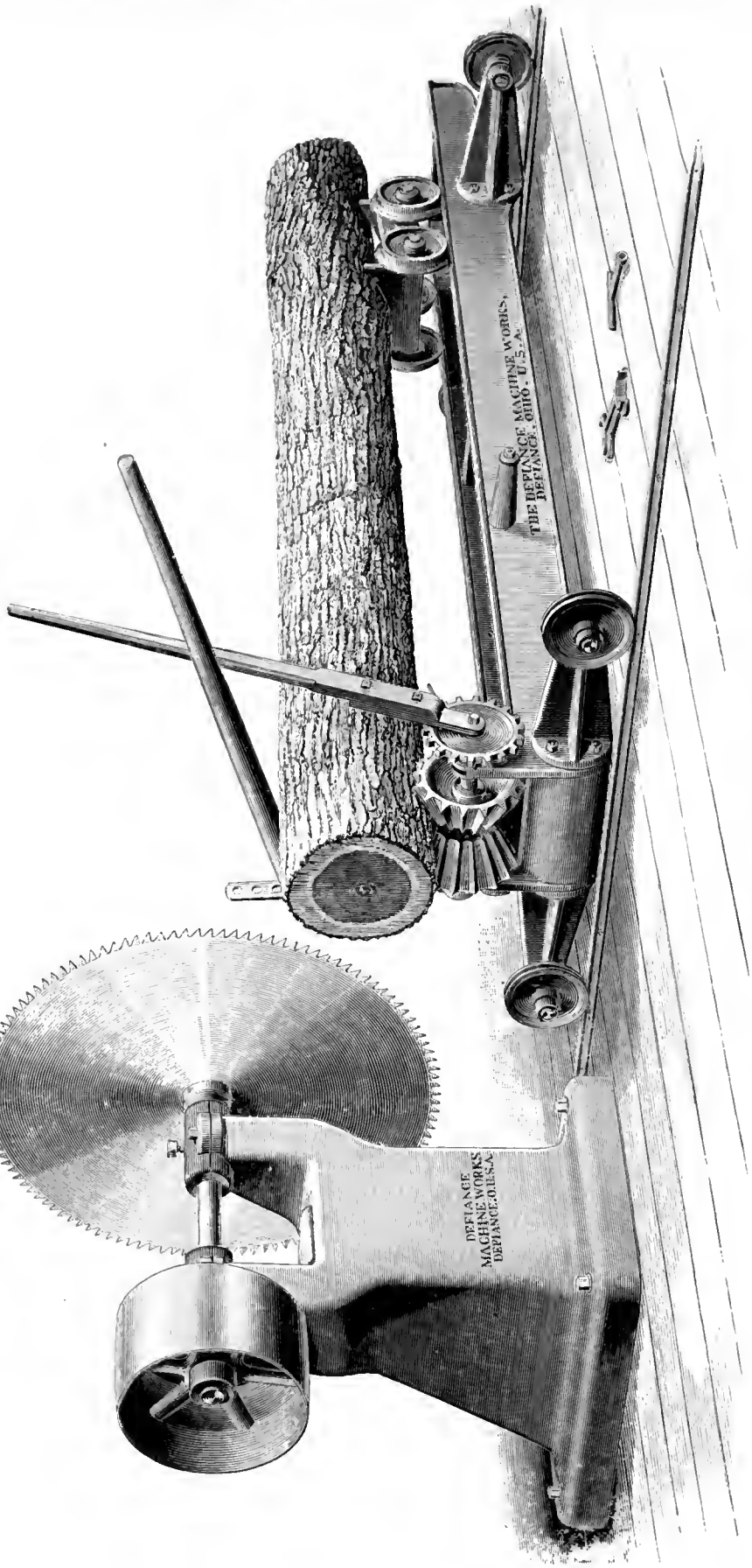
THIS ENGRAVING represents a very useful machine used by plow handle makers, designed especially for polishing the entire surface of the bent portion of plow handles. The only necessary movement by hand, of the handle, is that of swinging the straight part or shaft of the handle, in a horizontal plane through about one-fourth of a circle, holding the bend flatwise upon the rest and pressing it against the sand belt, which revolves around the handle and reaches every portion of the bend, with a capacity to finish 3,000 handles per day.

THE SAND BELT PULLEYS are fitted to steel spindles running in genuine babbitt metal boxes at each end of the revolving arms, and they are strained outward by hand-screws to tighten the sand belt, taking a belt 15 feet at the longest and accommodating a variation of 2 feet in length of the belt, which is 3″ wide.

THE TWO PULLEYS, as shown in the engraving, without belts, are to be driven in opposite directions; the larger one from the small pulley on the counter. As the observer stands facing the machine the arms supporting the sand belt pulleys should revolve from the right hand over to the left, and the sand belt should run in the opposite direction.

A COUNTER is furnished as follows: Two No. 1 hangers; shaft, $1\frac{1}{8}'' \times 48''$; driver for driving the arms, $2\frac{3}{4}''$ diameter, 4″ face; driver to drive sand belt, 18″ diameter, 4″ face; tight and loose pulleys, 10″ diameter, 5″ face; speed, 350 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, $60'' \times 72''$.



No. 7 Improved Heavy Iron Frame Circular Cut-Off Saw.

Export Shipping Weight, 4,300 Pounds.
Net Weight, 3,100 Pounds.
Cubic Measurement, 147 Feet.
Cable Word, SUSQUE.

No. 7 Improved Heavy Iron Frame Circular Cut-Off Saw.

Export Shipping Weight, 4,300 Pounds.

Net Weight, 3,100 Pounds.

Cubic Measurement, 147 Feet.

Cable Word, SUSQUE.

THIS ENGRAVING represents our No. 7 Improved Heavy Iron Frame Circular Cut-Off Sawing Machine used for equalizing logs, cutting them to the proper length suitable for making hubs, spokes, staves, heading, handles, hoops, and other similar work, and it is a most useful machine to manufacturers who purchase their material in the log and desire to cut it to exact lengths.

THE FRAME of this machine is a heavy casting in one piece, with cored center, of sufficient weight to stand firm.

THE SAW ARBOR, of steel, is $2\frac{5}{16}$" diameter, with the saw end fitted with heavy steel collars which are provided with two $\frac{5}{8}$" steel pins in a 4" circle to hold the saw, and it runs in heavy genuine babbitt metal self-lubricating bearings.

THE CARRIAGE which supports the log is constructed of iron and steel throughout. It rests upon friction rolls which are accurately turned, with a groove in the face, and fitted with reamed holes, upon steel spindles. They travel upon steel sawmill track to move the carriage to and from the saw. The small carriage with flanged wheels is mounted upon the lower carriage and upon this rests one end of the log. The other end is securely held between cone-shaped spur rolls, and to their shaft a ratchet lever is attached to feed the log to the saw for regulating the length of cut. The pawl attached to the ratchet lever is reversible and can be used to feed the log forward or backward. All the movements of the carriage operate with the greatest ease. The small carriage, or truck, used on top of the larger one can be used for conveying logs from the yard to the machine by simply building a track outward from the end of the main carriage.

THE SAW furnished with this machine is 48" diameter; it will cut off material 21" diameter and it is fitted with a 2" hole to fit the arbor. Larger saws can be used if so desired.

THE PULLEY ON SAW ARBOR is 18" diameter, 10" face; speed for 48" saw, 750 rotations per minute; with 56" saw, 650 rotations; with 60" saw, 600 rotations, and with 72" saw, 500 rotations per minute.

THIS MACHINE is the heaviest and most rapid circular cut-off saw on the market. It is simple in all its parts and can be handled successfully by cheap labor, and it is furnished complete as shown.

HORSE POWER to drive, 10.

THE FLOOR SPACE occupied by this machine is 20 feet by 10 feet over all. The carriage is 14 feet in length.

No. 2 Automatic Hub Block Boring Machine.

Export Shipping Weight, 3,700 Pounds.
Net Weight, 3,100 Pounds.
Cubic Measurement, 110 Feet.
Cable Word, HIWAI.

No. 2 Automatic Hub Block Boring Machine.

Export Shipping Weight, 3,700 Pounds.

Net Weight, 3,100 Pounds.

Cubic Measurement, 110 Feet.

Cable Word, HIWAI.

THIS ENGRAVING represents our No. 2 Automatic Hub Block Boring Machine, which has been designed especially for the use of the makers of hubs, used for vehicle wheels for rapidly and accurately boring a straight hole from each end of the block and removes the heart regardless of the outside shape of the block.

IT WILL bore blocks from the smallest sizes up to 14″ diameter, 18″ long, at the rate of about 5,000 blocks in ten hours.

THE FRAME is a heavy casting in one piece, with cored center of neat design, with the top accurately planed to receive the boring and clamping saddles, which are firmly gibbed to it.

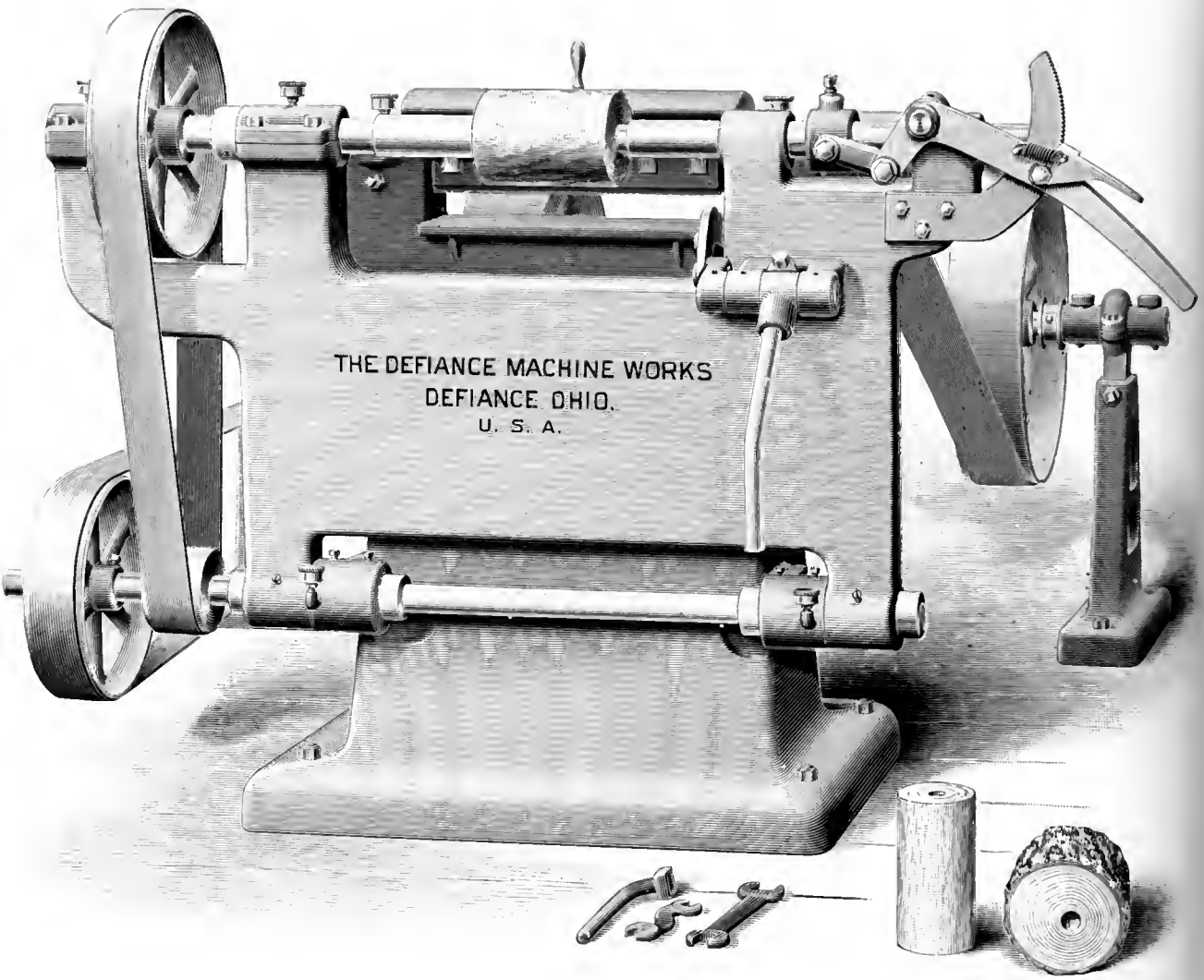
THE HUB BLOCK is gripped at each end between steel jaws, which are propelled by a convenient hand lever, and they can always be placed into the machine with the heart central with the boring bits even though the heart is not in the center of the block. It is extremely essential to bore out the heart in order to secure perfect hubs.

THE BORING SPINDLES, of steel, large in diameter, rotate in long self-lubricating bearings. The head stocks supporting them are gibbed to the top of the frame, and they have an automatic horizontal movement to or from each other by a slight touch of the operator's foot on the pedal at the base of the machine, both bits commencing to bore from each end at the same time, one bit boring to the center, then slightly receding, when the other bit at the same instant bores slightly beyond the center to finish the hole, then both return automatically ready for the next block.

ALL THE MOVEMENTS of this machine are so quick and simple that no skill or labor is required on the part of the operator except to place the work in the machine and remove the finished product. It is so strong and powerfully constructed that it can be crowded to its full capacity without injury to the working parts.

TWO COUNTERS are furnished with this machine, and they are each supplied with tight and loose pulleys, 12″ × 6″, and they should run 750 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 36″ × 104″.



No. 2 Automatic Hub Block Roughing Machine.

Export Shipping Weight, 2,200 Pounds.

Net Weight, 1,700 Pounds.

Cubic Measurement, 81 Feet.

Cable Word, HONDURAS.

No. 2 Automatic Hub Block Roughing Machine.

Export Shipping Weight, 2,200 Pounds.

Net Weight, 1,700 Pounds.

Cubic Measurement, 81 Feet.

Cable Word, HONDURAS.

THIS ENGRAVING represents our No. 2 Automatic Hub Block Roughing Machine, especially designed to receive the rough hub block as it is sawed from the log and remove the bark and reduce it to the required diameter. It is calculated to work material from the shortest lengths and smallest sizes up to 18″ long by 14″ in diameter.

IT IS a strong, powerful machine belted at both ends of the cylinder so that the heaviest cut can be taken without diminishing the speed, and it is so conveniently constructed that 5,000 blocks of ordinary sizes can be finished in ten hours.

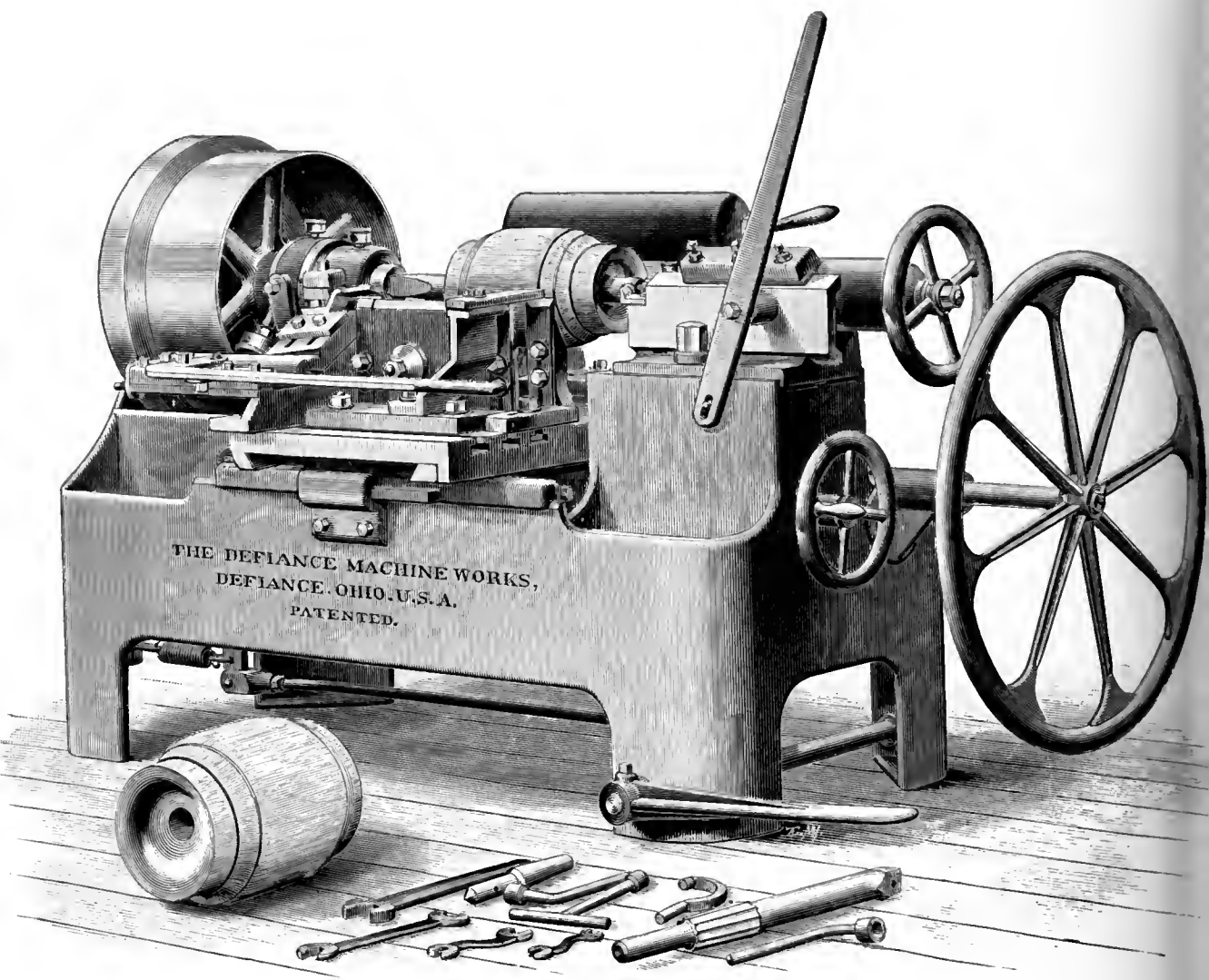
THE FRAME is a heavy casting in one piece, with cored center and a broad floor base to stand firm, with the cylinder mounted on the top in long self-lubricating bearings, the lower half of which is cast solid to the frame.

THE HUB BLOCK is held between quick acting centers which are fitted into substantial bearings on top of the heavy swinging frame, which is hinged at the bottom of the main frame of the machine upon a heavy steel shaft. The swinging movement to carry the hub block to and from the knives is secured by a powerful hand lever. The operator can instantly move the hub block to or from the cutters by a slight movement of the lever. By this device the block can be turned to any desired diameter, turning large or small blocks without any adjustment of the machine whatever.

THE CYLINDER, of forged steel, carries four knives and runs in long heavy self-lubricating bearings. It is driven from each end by 5″ belting, which supplies ample power to handle the heaviest work with ease. The chips are discharged at the rear of the machine through an opening in the frame to which a blower pipe can be easily attached.

THE COUNTER is furnished as follows: Shaft, 74″ long by 1 15/16″ diameter; two ball and socket adjustable drop hangers with self-oiling boxes; two 24″ × 5″ driving pulleys; one 4¼″ × 3½″ pulley to drive feed; tight and loose pulleys, 12″ × 6″; speed, 665 rotations per minute.

HORSE POWER to drive, 4; floor space occupied, 65″ × 72″.



No. 1 Patent Automatic Hub Turning Machine.

Export Shipping Weight, 4,400 Pounds.

Net Weight, 3,500 Pounds.

Cubic Measurement, 115 Feet.

Cable Word, LEVEE.

No. 1 Patent Automatic Hub Turning Machine.

Export Shipping Weight, 4,400 Pounds.
Net Weight, 3,500 Pounds.
Cubic Measurement, 115 Feet.
Cable Word, LEVEE.

THE No. 1 PATENT AUTOMATIC HUB TURNING MACHINE illustrated herewith, is the largest and most powerful machine of its class, designed especially for making carriage and wagon hubs of different sizes and shapes up to 18″ diameter, 18″ long at the largest, having a capacity for finishing 600 heavy hardwood hubs in ten hours, or roughing out 2,500 blocks.

THIS MACHINE receives the block in its rough state, performs the roughing, turning, cupping, finishing the ends, cutting beads and shoulders for bands, making hubs any shape or size complete at one operation more uniform and perfect and at an immense saving over hand turning.

THE FRAME of this machine is composed of iron, a massive casting in one piece, of neat design and of sufficient weight to stand firm and perform the heaviest turning without jar or injury to the working parts.

THE CARRIAGE is built in two parts. The lower half is gibbed and fitted to the frame in angular ways, with adjustment horizontally in line with the mandrel by hand-wheel and screw to center the knives with the turning. The upper table with the roughing and finishing knives attached at either end is mounted upon and gibbed to the lower table, and it slides from right to left at right angle with the mandrel by turning the large hand-wheel to bring either the roughing or the finishing knives up to the work to be turned.

THE ROUGHING KNIFE is 18″ long and it is held in a stand at the back end of the sliding carriage with its cutting edge extending downward, and when in operation removes the surplus material from the hub block in the form of a veneer or ribbon ⅛″ thick, full length of hub, at one cut, requiring no adjustment for length or diameter of block. A gauge governs the depth of cut and the amount of feed.

THE PATENT FINISHING KNIVES are located at the opposite end of the carriage from the rougher knife, with their cutting edges extending upward, consisting of a body knife with cutting edge shaped to correspond with the style of hub to be turned, and flat knives at either end for cutting the band seats and cutting off the hub to the proper length.

THE CUPPING ATTACHMENT is gibbed to the tail stock and provided with a gauge to regulate the depth of cut. The shape of knife governs the style of cup. A special back cupping attachment can be furnished when so ordered, which attaches to the carriage of the machine.

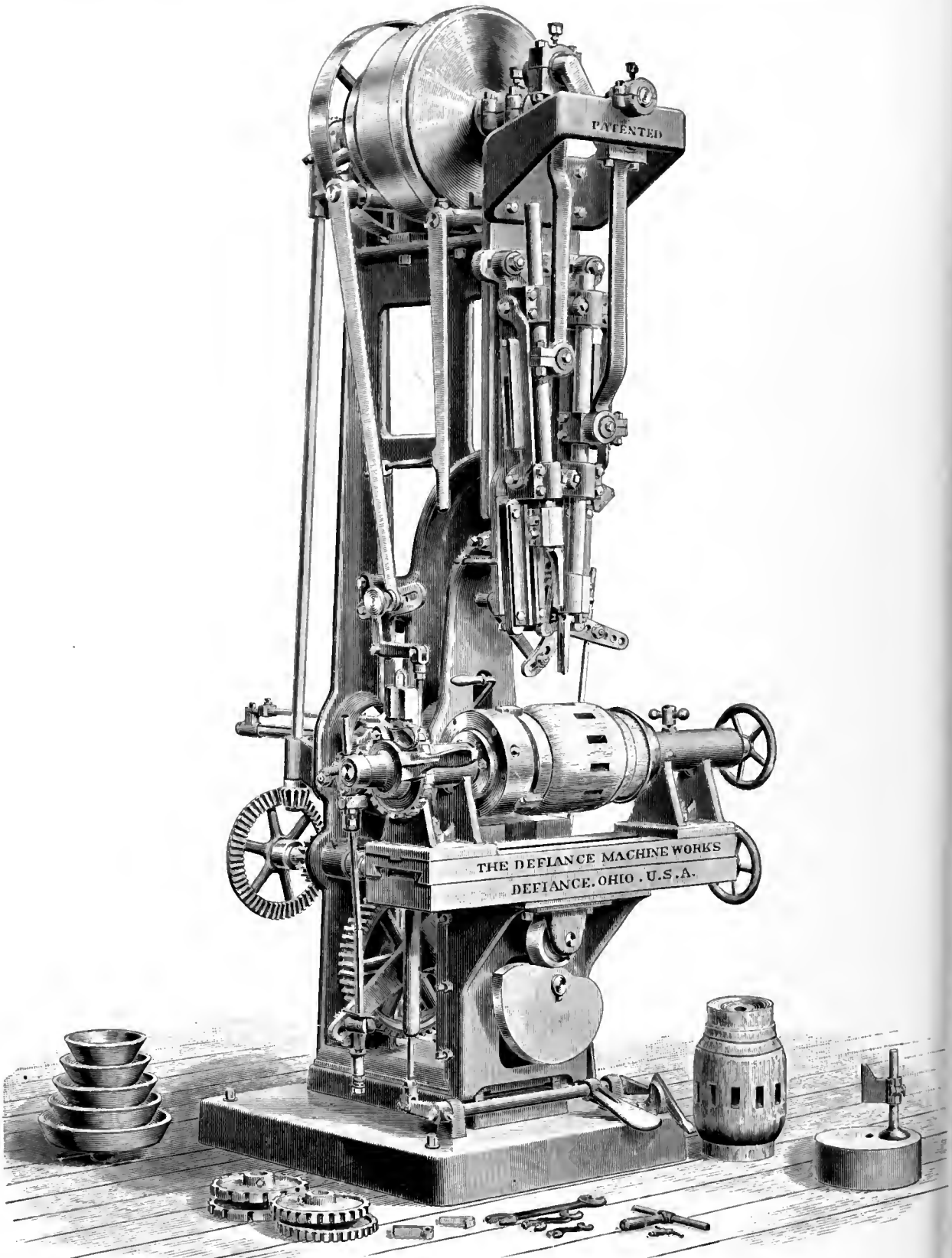
A POWERFUL FRICTION CLUTCH, fitted upon a 3″ steel spindle driven by an 8″ belt, communicates power to revolve the hub. The frictions are engaged or disengaged by a convenient foot treadle. A single movement of the operator's foot upon the treadle instantly starts or stops the machine without changing the position of the operator or shifting the belt.

THE OPERATOR has complete control over the machine from the working side. As the material to be operated upon revolves, the roughing knife is first presented to its action by turning the large hand-wheel to the left, reducing the hub block to the proper diameter for the finishing knives. By a reverse movement, the roughing knife retreats, and the finishing knives which shape the hub to the desired form and length are brought into service. The diameter of turning is regulated with graduating screws attached to the carriage, and when once adjusted for hubs of one diameter no further adjustment is required, and all hubs will be turned to exact size and shape at one starting and stopping of the machine.

THE COUNTERSHAFT is 2⅞″ diameter, 56″ long; two No. 3 hangers, 28″ drop; one belt shifting apparatus, complete; one driving pulley, 40″×8″; tight and loose pulleys, 20″×8″; speed, 400 rotations per minute.

FRICTION PULLEY on machine, 20″×8″; speed, 800 rotations per minute.

HORSE POWER to drive, 6; floor space occupied, 48″×84″.



No. 1 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 3,900 Pounds.
Net Weight, 2,900 Pounds.
Cubic Measurement, 155 Feet.
Cable Word, MACKINAW.

No. 1 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 3,900 Pounds.
Net Weight, 2,900 Pounds.
Cubic Measurement, 155 Feet.
Cable Word, MACKINAW.

THE ENGRAVING represents our No. 1, medium sized, Automatic Hub Mortising and Boring Machine, for the mortising or re-mortising of hubs from 3″ to 11½″ diameter, cutting mortises from $\frac{3}{16}$″ to 1¼″ wide, various lengths, adapted to either straight or stagger work, and is recommended for hub, wheel, or wagon building, where both light and heavy mortising is required.

THE FIRST AUTOMATIC MORTISING MACHINE was built by us in the year 1868, since then passing through many stages of patented improvements. After many years of careful study we offer a full automatic machine, that for accuracy, simplicity, convenience, efficiency, and economy meets the highest requirements as a labor-saving machine for hub and wheel making, and is now used by all well-equipped modern concerns in this line.

THE FRAME is cast in one piece, well braced, provided with a broad floor support, with the driving power at the top, consisting of a double faced friction driver running loose upon the shaft between a disc, made stationary to the shaft, for driving the chisel bars, and a loose pulley on the opposite side for driving the auger spindle, each having taper friction faces that correspond with the faces on the driver. The driver is fitted free between the frictions, and its position is controlled by a combined hand and foot lever. The operator, by placing his foot upon the pedal, immediately engages the driver with either friction, instantly starting the mortising or boring departments as desired, each acting independently, entirely avoiding the constant running of such parts of the machine as are not actually engaged in service. In relieving the frictions an automatic brake is applied. In stopping the machine entirely, the driver is placed at an intermediate position to the frictions, acting at this point as a loose pulley.

THE CHISEL BARS, of steel, large in diameter, are arranged side by side upon the front of the frame, sliding in bronze metal boxes, their axis being on a vertical plane at right angles to the crank shaft. Each is adjustable for giving the mortise desired dish and taper.

THE OUTSIDE BEARING to the double crank shaft insures a steady and uniform stroke. The crank and connecting rods, of steel, are supplied with adjustable phosphor bronze bearings.

THE KNEE which supports the table is fitted to the frame in angle ways, provided with gibs having a substantial bearing 12″ wide, 18″ long.

THE TABLE holding the hub has a longitudinal and transverse (right angular) adjustment with the chisel bars, for regulating the position of the mortise with the chisels.

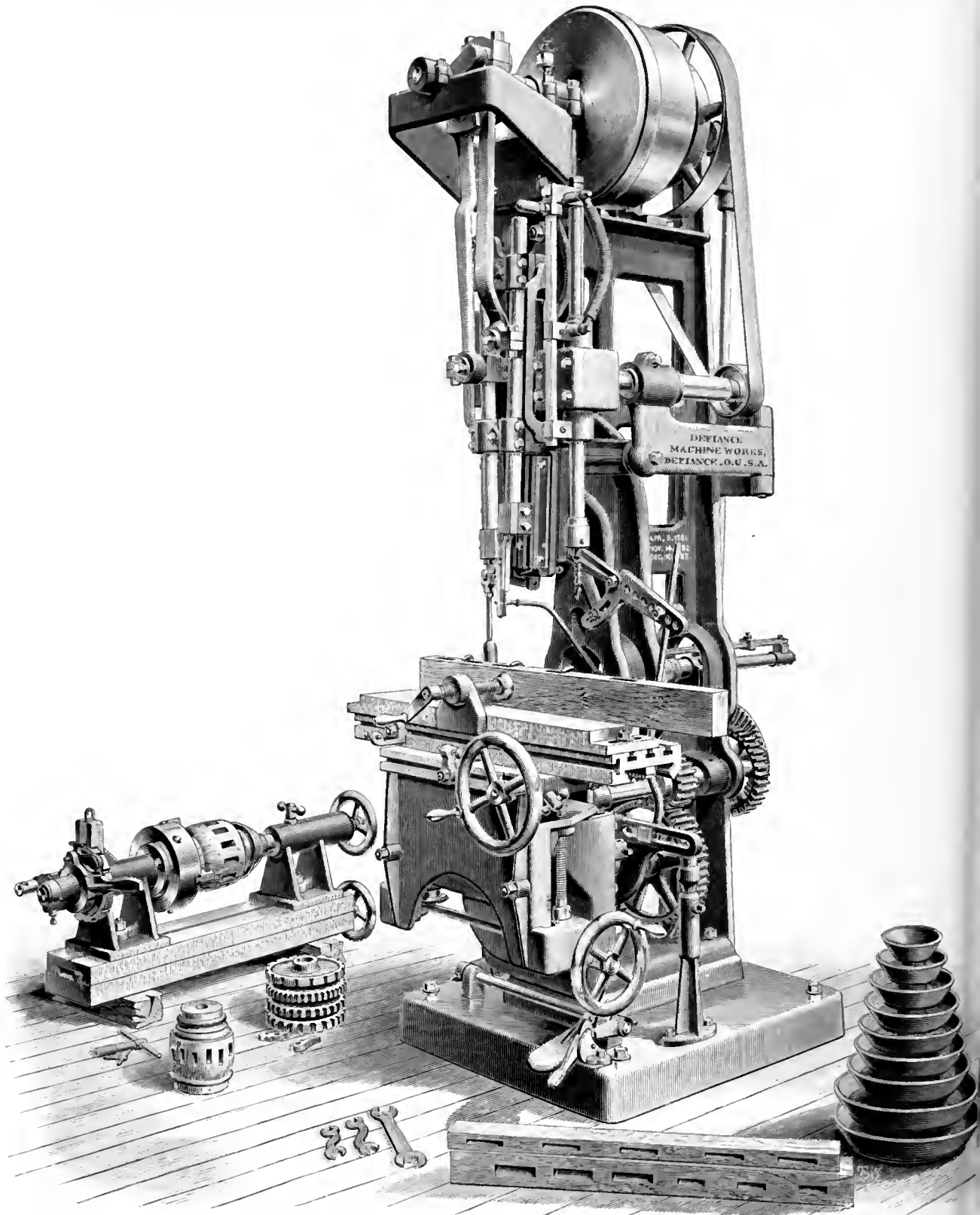
THE BED holding the hub is elevated to the chisels by a lifting cam operating on a friction roller, and is driven by a positive motion direct from the top shaft; thus the numerous movements all work in exact time, in relation to each other.

THE HUB to be mortised is held at one end in a three-jawed universal chuck, the jaws acting simultaneously by turning with a key any one of the screw heads, the other end turning in a taper cup, and is automatically presented to the action of the chisels by the vertical movement of the bed. When the mortise is cut, it descends by its own gravity. A dial is attached to the head spindle, having as many notches in its circumferential edge as there are mortises to be cut in the hub, the dial moving the distance of one notch to turn the hub every time a mortise has been cut.

IN OPERATION, the table carrying the hub is gradually lifted to the chisels until the full depth of cut is reached, then it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate ready for the next mortise, and it is again presented for the action of the chisels, and so continuing until the mortises are finished. The jigging, spacing, feeding, etc., are entirely automatic in their movements, thus rendering it easy for one operator to run two machines, besides affording him ample time to arrange his hubs for prompt insertion into the machine, and produce the mortising of from 750 to 800 hubs per ten hours.

SIZE OF FRICTION DRIVER, 18″×5″; speed, 400 revolutions per minute, driven by a 5″ belt direct from the main line.

HORSE POWER to drive, 2; floor space occupied, 40″×44″.



No. 1½ Patent Double Chisel Combined Hub and Plain Mortising Machine.

Export Shipping Weight, 4,600 Pounds.
Net Weight, 3,500 Pounds.
Cubic Measurement, 155 Feet.
Cable Word, MOORE.

No. 1½ Patent Double Chisel Combined Hub and Plain Mortising Machine.

Export Shipping Weight, 4,600 Pounds.

Net Weight, 3,500 Pounds.

Cubic Measurement, 155 Feet.

Cable Word, MOORE.

THIS ENGRAVING represents our No. 1½ Patent Automatic Double Chisel Mortising and Boring Machine, designed for automatically mortising hubs from the smallest sizes up to 11½″ diameter, cutting the mortises straight or stagger at the rate of 400 hubs per day. It is equally well adapted for cutting mortises of the regular kind in hard or soft wood, from ⅛″ to 1½″ wide up to 5″ long, such as are required in wagon, carriage, furniture and agricultural implement shops, and when not engaged in mortising, the boring spindles may be utilized as a regular boring machine.

THIS MACHINE is calculated to do four distinct classes of work, hub mortising, regular carpenter mortising in straight work, and as a general boring machine, for vertical and horizontal boring; and it also has the advantage of doing the work more perfectly and six times faster than it can be accomplished with a single chisel machine.

THE FRAME is a heavy casting in one piece, with the driving power at the top. It has two chisel bars arranged side by side upon the front of the column, their axis being on a vertical plane at right angles to the axis of the main shaft, and they are adjustable to give the mortises desired dish and taper.

THE HORIZONTAL BORING SPINDLE is conveniently fitted through the main frame, with a universal chuck for holding the auger, having adjustments to bore holes for straight or stagger mortises, and it is intended for hub work and general boring.

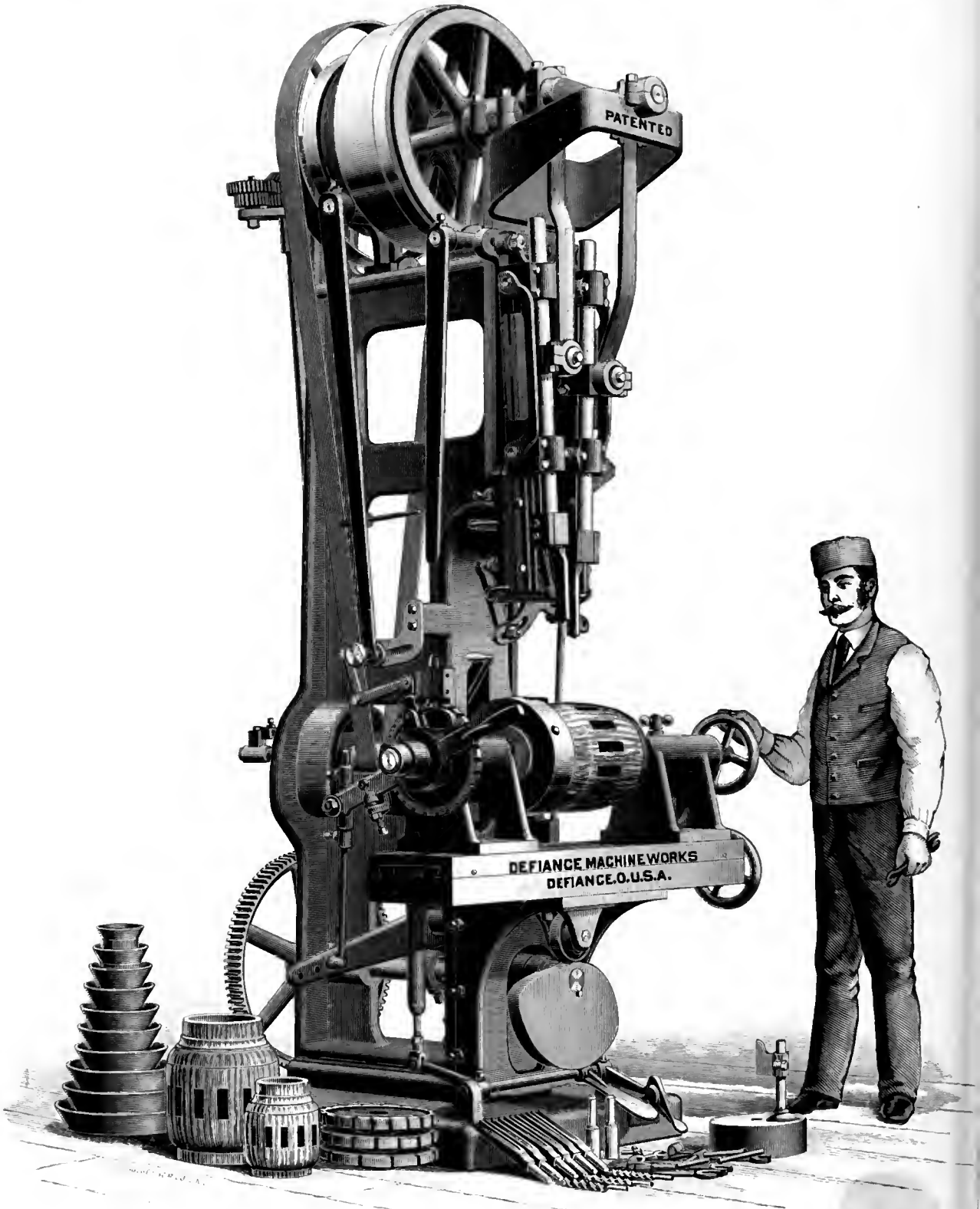
IN MORTISING HUBS the attachment, as shown on the floor, is used; it holds the hub at one end in a three-jawed universal chuck, the other end turning in a taper cup; the weight of the operator's foot upon the treadle at the base of the machine instantly starts the chisel bars and the table carrying the hub is gradually lifted to the chisels, until the full depth of cut is reached, when it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate ready for the next mortise, and it is again presented to the action of the chisels and so continuing until all of the mortises are finished; the jigging, spacing, feeding, etc., are entirely automatic in their movements, and all of the adjustments are of the simplest character.

FOR STRAIGHT MORTISING the table on which the timber rests has a screw clamp for holding the work; it has a longitudinal and transverse (right angular) adjustment for regulating the position of the mortise to be made, and the work is automatically presented to the action of the chisels as explained above. 6,000 medium sized mortises in soft wood can be cut in 10 hours without a variation in the dimensions of the mortises of $\frac{1}{100}$″ from a specific measurement. It will make mortises tapering in either direction or parallel, as desired, or tapering at one end and perpendicular to the surface at the other end. No painstaking, difficult, and uncertain jigging of a carriage is required, and no reversing of chisels.

THE VERTICAL BORING APPARATUS is contained within an iron case completely covering the gears, and so constructed that the center of the auger is always exactly in line with the center of the chisels, so that the object, after being bored, has only to be moved horizontally to bring it in proper place under the chisels to receive the mortises; the boring spindle has a radial adjustment for boring holes to any angle.

THE FRICTION DRIVE PULLEY is 18″ diameter, 5″ face, speed, 400 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 40″×44″.



No. 2 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 6,300 Pounds.
Net Weight, 5,100 Pounds.
Cubic Measurement, 266 Feet.
Cable Word, MANITOBA.

No. 2 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 6,300 Pounds.
Net Weight, 5,100 Pounds.
Cubic Measurement, 266 Feet.
Cable Word, MANITOBA.

THE No. 2 AUTOMATIC DOUBLE CHISEL HUB MORTISING MACHINE, with boring attachment, as represented by the accompanying engraving, is the largest sized machine of its class built, and is used for mortising or re-mortising hubs from 3″ to 17½″ diameter, cutting mortises in hard wood, from the smallest sizes to 2¼″ wide, 5½″ long, either straight or stagger, covering all the requirements of wagon, heavy truck, and artillery wheel builders.

THESE MACHINES were first introduced in the States in the year 1868, since then passing through many stages of patented improvements, reaching the highest standard as a labor-saving machine for hub and wheel making, reducing the cost fully one-half, and performing the work more accurately than by any other method.

THE COLUMN is cast in one piece, properly braced, and provided with a broad base to stand firm, with the driving power at the top, consisting of a friction clutch, which is controlled by a combined hand and foot lever. The operator, in placing his foot upon the pedal, instantly starts the boring or mortising departments as desired; each acting independently entirely avoids the constant running of such parts of the machine as are not engaged in service. In relieving the frictions an automatic brake is applied to stop the machine instantly, thus the operator has complete control over the machine.

THE CHISEL BARS, of steel, large diameter, are arranged side by side upon the front of the frame, their axis being on a vertical plane at right angles to the crank shaft. Each chisel bar is adjustable for giving the mortise desired dish and taper.

THE OUTSIDE BEARING to the double crank insures a steady and uniform stroke. The crank and connecting rods, of steel, are supplied with adjustable phosphor bronze bearings.

THE KNEE supporting the table is fitted to the frame in planed and scraped angle ways, and it is elevated to the chisels by a lifting cam operating on a friction roller driven by a positive motion from the crank shaft; thus the upper and lower movements of the machine work in exact time with each other.

THE TABLE holding the hub has a longitudinal and transverse (right angular) adjustment with the chisel bars, for regulating the position of the mortise with the chisels.

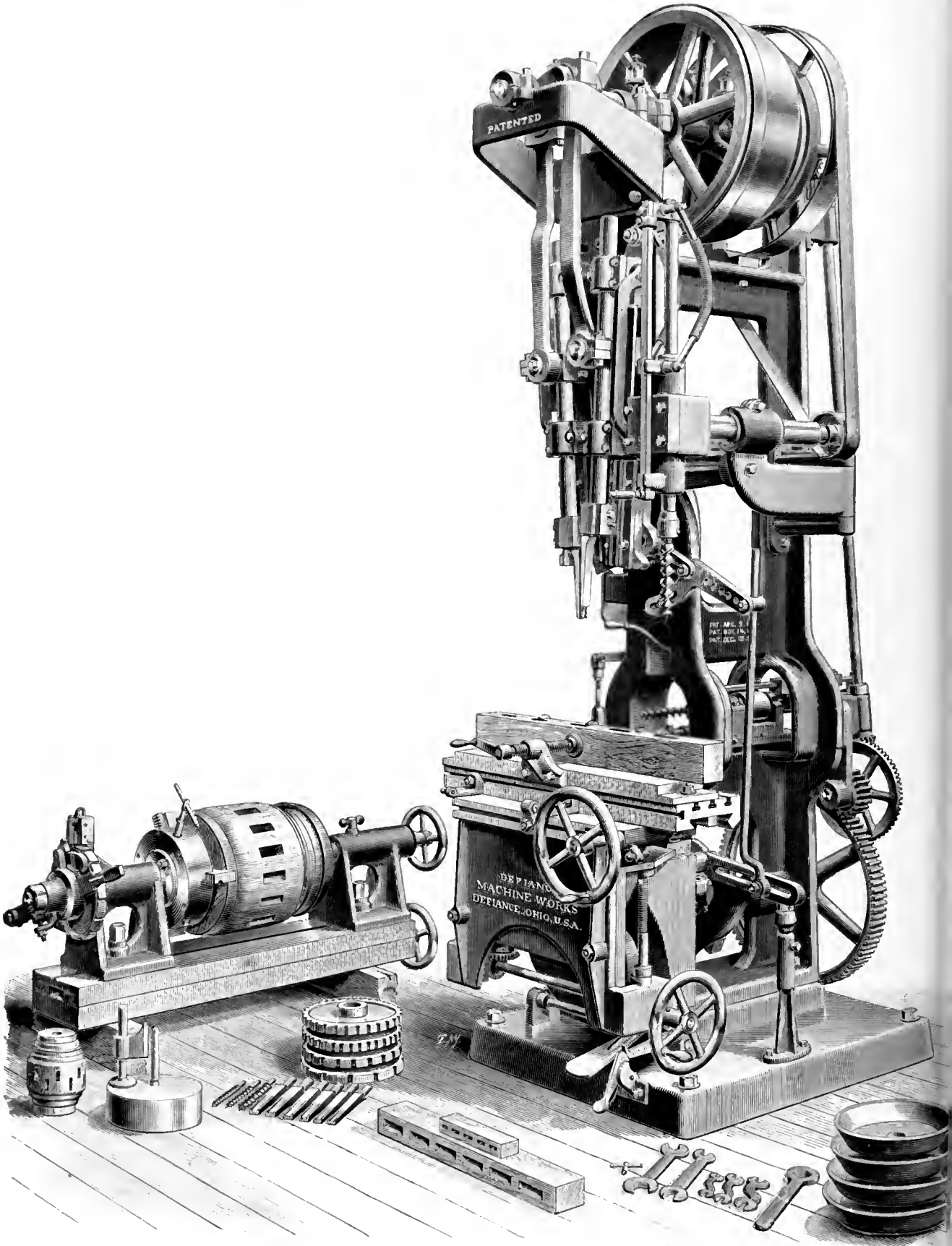
THE HORIZONTAL BORING SPINDLE is conveniently fitted through the main frame with a universal chuck for securing the bit, having adjustments to bore holes for straight or stagger mortises. The center of the auger and hub agree when the bed is at its lowest position.

THE HUB to be mortised is held at one end in a three-jawed universal chuck, the jaws acting simultaneously by turning with a key any one of the screw heads, the other end turning in a taper cup, and is automatically presented to the action of the chisels by a vertical movement of the bed. When the mortise is cut, it descends by its own gravity. A dial is attached to the head spindle, having as many notches in its circumferential edge as there are mortises to be cut in the hub, the dial moving the distance of one notch to turn the hub every time a mortise has been cut.

IN OPERATION, the table carrying the hub is gradually lifted to the chisels until the full depth of cut is reached, then it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate, ready for the next mortise, and it is again presented for the action of the chisels, and so continuing until the mortises are finished. The jigging, spacing, feeding, etc., are entirely automatic in their movements, thus rendering it easy for one operator to run two machines, besides affording him ample time to arrange his hubs for prompt insertion into the machine, and produce the mortising of 400 hubs per ten hours.

SIZE OF FRICTION DRIVER, 24″×6″; speed, 300 rotations per minute, driven by a 6″ belt direct from the main line, requiring no counter except for convenience.

HORSE POWER to drive, 2½; floor space occupied, 48″×52″.



No. 2½ Patent Double Chisel Combined Hub and Plain Mortising Machine.

Export Shipping Weight, 7,100 Pounds.
Net Weight, 5,800 Pounds.
Cubic Measurement, 266 Feet.
Cable Word, MECCA.

No. 2½ Patent Double Chisel Combined Hub and Plain Mortising Machine.

Export Shipping Weight, 7,100 Pounds.

Net Weight, 5,800 Pounds.

Cubic Measurement, 266 Feet.

Cable Word, MECCA.

THIS ENGRAVING represents our No. 2½ Patent Automatic Double Chisel Mortising and Boring Machine, designed for automatically mortising hubs from the smallest sizes up to 17½" diameter, cutting the mortises straight or stagger at the rate of 400 hubs per day. It is equally well adapted for cutting mortises of the regular kind in hard or soft wood, from ⅛" to 2¼" wide, up to 5½" long, such as required in wagon, carriage, furniture and agricultural implement shops, and, when not engaged in mortising, the boring spindles may be utilized as a regular boring machine.

THIS MACHINE is calculated to do four distinct classes of work, hub mortising, regular carpenter mortising in straight work, and as a general boring machine, for vertical and horizontal boring; and it also has the advantage of doing the work more perfectly and six times faster than it can be accomplished with a single chisel machine.

THE FRAME is a heavy casting in one piece, with the driving power at the top. It has two chisel bars arranged side by side upon the front of the column, their axis being on a vertical plane at right angles to the axis of the main shaft, and they are adjustable to give the mortises desired dish and taper.

THE HORIZONTAL BORING SPINDLE is conveniently fitted through the main frame with a universal chuck for holding the auger, having adjustments to bore holes for straight or stagger mortises, and it is intended for hub work and general boring.

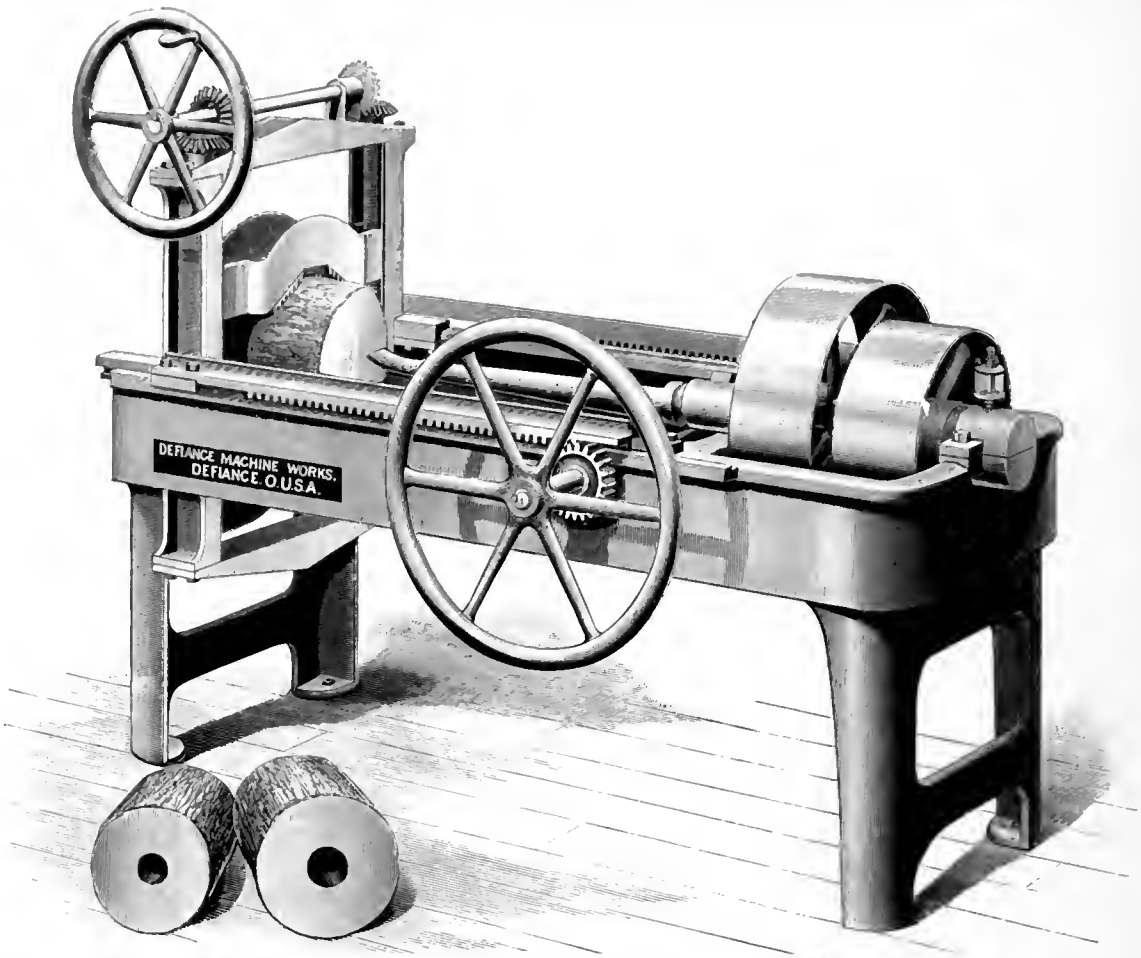
IN MORTISING HUBS the attachment, as shown on the floor, is used; it holds the hub at one end in a three-jawed universal chuck, the other end turning in a taper cup. The weight of the operator's foot upon the treadle at the base of the machine instantly starts the chisel bars, and the table carrying the hub is gradually lifted to the chisels until the full depth of cut is reached, when it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate ready for the next mortise, and it is again presented to the action of the chisels, and so continuing until all of the mortises are finished. The jigging, spacing, feeding, etc., are entirely automatic in their movements, and all of the adjustments are of the simplest character.

FOR STRAIGHT MORTISING the table on which the timber rests has a screw clamp for holding the work; it has a longitudinal and transverse (right angular) adjustment for regulating the position of the mortise to be made, and the work is automatically presented to the action of the chisels as explained above. 6,000 medium sized mortises in soft wood can be cut in 10 hours without a variation in the dimensions of the mortises of $\frac{1}{1000}$" from a specific measurement. It will make mortises tapering in either direction or parallel, as desired, or tapering at one end and perpendicular to the surface at the other end. No painstaking, difficult, and uncertain jigging of a carriage is required, and no reversing of chisels.

THE VERTICAL BORING APPARATUS is contained within an iron case completely covering the gears, and so constructed that the center of the auger is always exactly in line with the center of the chisels, so that the object, after being bored, has only to be moved horizontally to bring it in proper place under the chisels to receive the mortises. The boring spindle has a radial adjustment for boring holes to any angle.

THE FRICTION DRIVE PULLEY is 24" diameter, 6" face; speed, 300 rotations per minute.

HORSE POWER to drive, 2½; floor space occupied, 48"×52".



No. 1 Improved Heavy Hub Boring Machine.

Export Shipping Weight, 2,100 Pounds.
Net Weight, 1,600 Pounds.
Cubic Measurement, 84 Feet.
Cable Word, BENGAL.

THIS IMPROVED No. 1 HEAVY HUB BORING MACHINE is the largest and most substantial machine of its class, arranged with self-centering chuck to receive hub blocks from 3″ to 20″ diameter and to bore or ream straight or taper holes from ⅞″ to 5″ diameter.

THIS MACHINE receives the hub block between powerful universal jaws, which hold it firm and central with the boring tool. In boring, the soft portion in the center of block is removed. By the use of our solid steel hub reamers, the hole is bored in the block complete at one operation to proper size and taper to fit the hub lathe mandrel upon which the block is turned and finished.

THE FRAME is large and heavy, cast in one piece, and well supported to withstand the heavy labor expected of it.

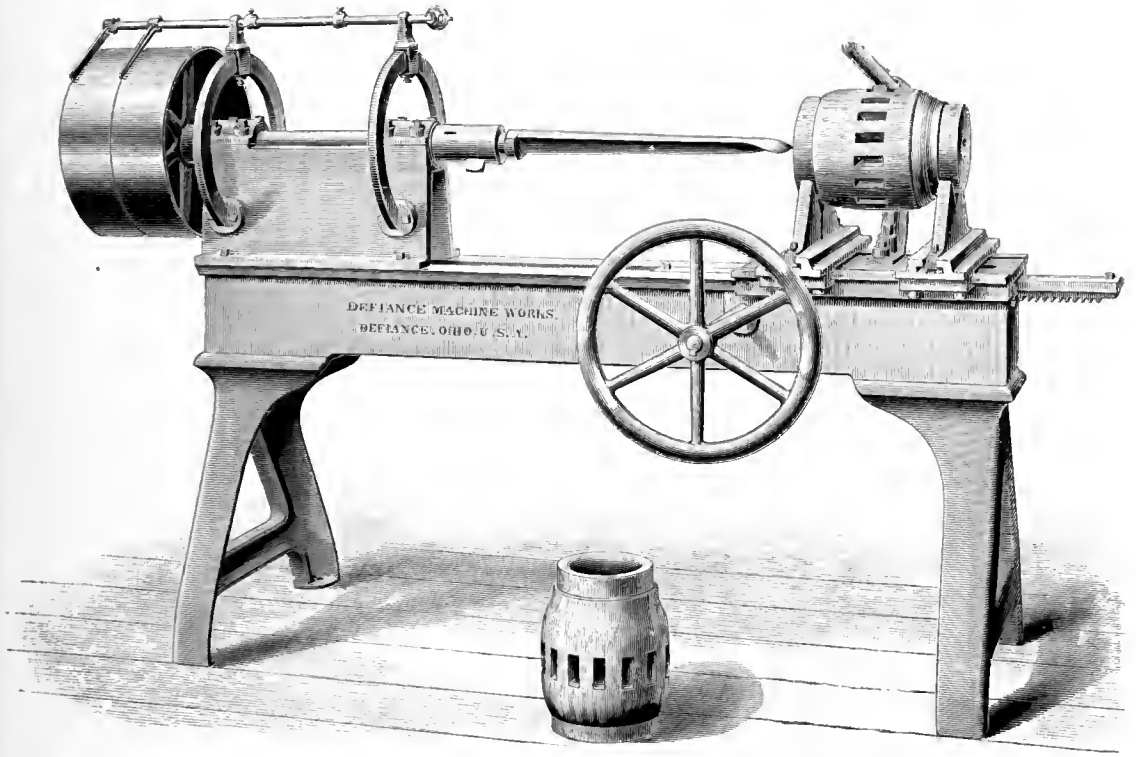
THE SPINDLE, of steel, $2\frac{15}{16}$″ diameter, is fitted into substantial bearings filled with genuine babbitt metal. The boring end is supplied with standard taper hole and key to receive the reamer. Chucks are furnished, when so ordered, for holding reamers with odd sized shanks.

THE HUB BLOCK is placed in and removed from the jaws when the carriage is moved to the back end of the machine, which is open, permitting the operator to handle the material without lifting it over the frame.

IN OPERATION, the hub is clamped between the universal jaws, which are self-centering, and it is presented to the action of the reamer by turning the large hand-wheel as shown.

DRIVING PULLEYS on spindle, 16″ × 6″ and 20″ × 6″, giving two changes of speed necessary for small and large reamers. Speed of spindle, 500 rotations per minute when the belt is used on the 20″ pulley.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}$″ × 48″; two No. 1 drop hangers; one driving pulley, 20″ × 6″, and one, 16″ × 6″; tight and loose pulleys, 16″ × 6″; speed, 650 turns per minute.



No. 1 Improved Hub Reaming Machine.

Export Shipping Weight, 1,300 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 54 Feet.
Cable Word, READING.

THIS ENGRAVING represents a strong and substantial machine made entirely of iron, with planed ways for the boring frame and sliding carriage, and it is calculated for rapidly and accurately reaming hubs after being turned and mortised, to clean the hole and remove the chips and slivers around the mortise holes.

THE FRAME is provided with heavy ways accurately planed, upon which is mounted the boring frame, which is supplied with a $1\frac{5}{16}$″ steel spindle; the boring end is fitted with a standard taper hole and key to receive and hold the reaming tool. The tight and loose pulleys are placed upon the outer end, admitting of belting in either direction.

THE HUB CARRIAGE is gibbed to the ways of the frame, and it carries four saddles which can be adjusted for hubs of varying lengths and diameters.

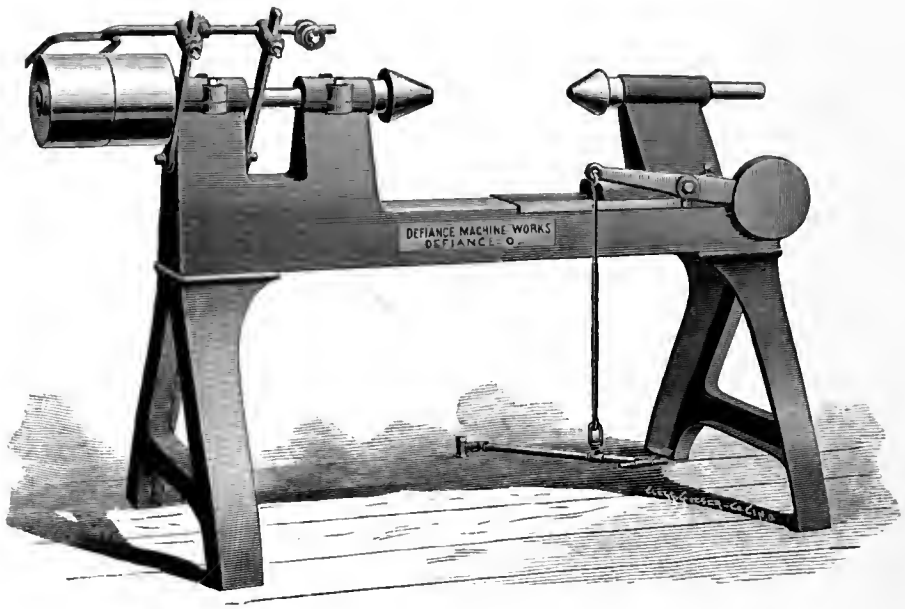
THE HUB is placed upon the saddles, resting upon its band seats, and it is firmly held in position by a short lever fitted with a finger, which is placed in one of the mortise holes; it is then presented to the action of the reamer by turning the large hand-wheel.

THIS NOVEL DEVICE for centering and holding the hub enables a single operator to ream 1,500 hubs in ten hours.

THIS MACHINE will receive hubs up to 20″ diameter.

THE TIGHT AND LOOSE PULLEYS are 16″×4″; speed, 500 rotations per minute.

HORSE POWER to drive, $\frac{1}{2}$; floor space occupied, 24″×72″.



No. 1 Improved Hub Polishing Machine.

Export Shipping Weight, 600 Pounds.

Net Weight, 400 Pounds.

Cubic Measurement, 30 Feet.

Cable Word, POLLY.

THE ACCOMPANYING ENGRAVING represents an improved machine used by hub, wheel, and wagon manufacturers for sanding or polishing plain and banded hubs of different sizes up to 20″ in diameter. It is calculated to be handled by cheap labor, and relieve the hub turner of this portion of the work, as well as for grinding down hub bands and finishing them.

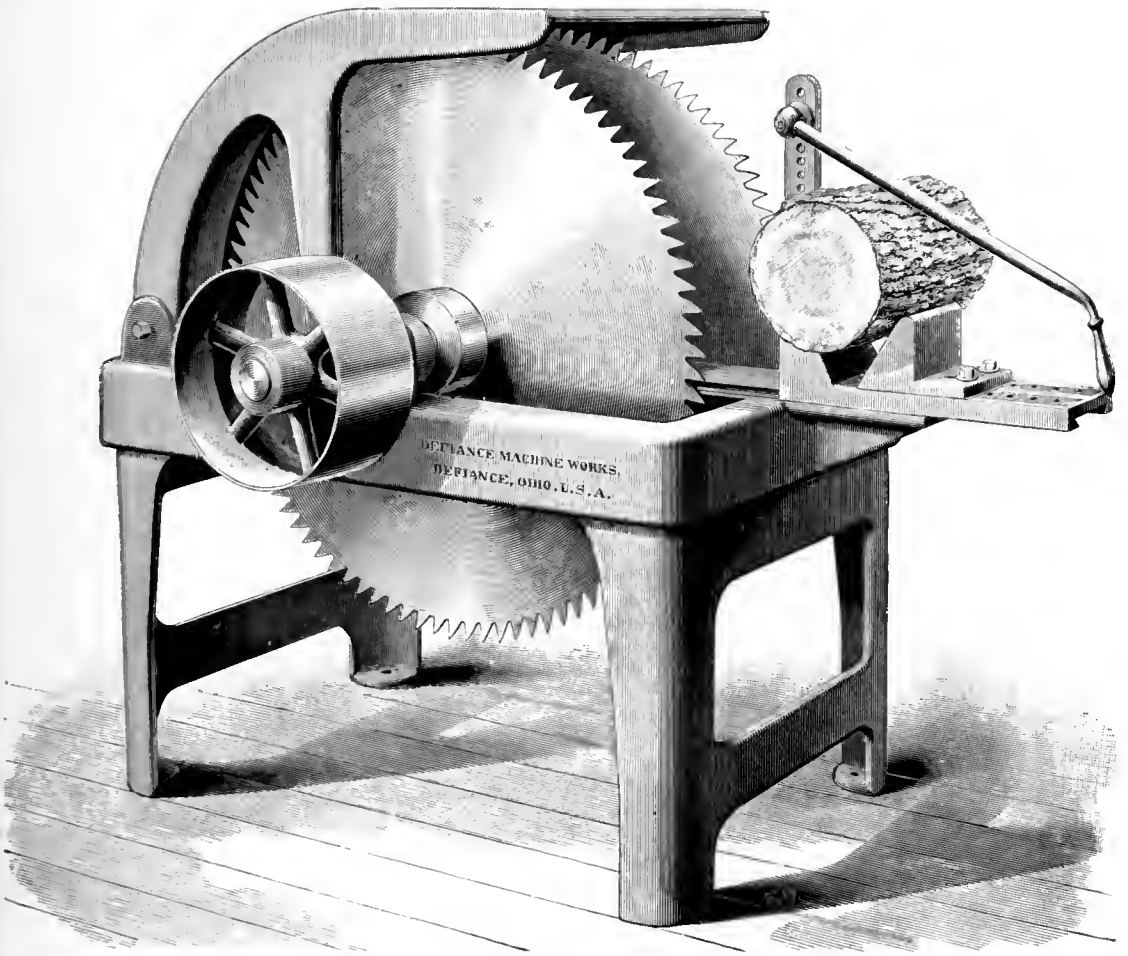
THE FRAME, of iron, is cast in one piece with cored center, and the lower bearings of the head spindle are cast solid to it.

THE SPINDLES, of steel, are fitted into genuine babbitt metal bearings, with a taper cone fitted to each by which the hub is centered and revolved; a single pair of cones accommodating all sizes of work.

THE TAIL SPINDLE slides in a horizontal plane and is operated to and from the hub by a convenient foot-treadle having a quick movement. In placing the hub between the cones or removing it, it is not necessary to stop the head spindle, simply release the tail center cone with the foot-treadle. The entire tail stock can be adjusted horizontally on the main frame for short or long hubs.

THE TIGHT AND LOOSE PULLEYS are 6″ diameter, 4″ face, and should run 1,200 rotations per minute. They can be belted to from above, below, or either side.

HORSE POWER to drive, ½; floor space occupied, 24″×60″.



No. 5 Heavy Double Hub Equalizing Saw.

Export Shipping Weight, 1,600 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 70 Feet.
Cable Word, SIDNEY.

THIS ENGRAVING represents an improved No. 5 heavy double hub equalizing machine, used by hub and wheel manufacturers for trimming off both ends of hub blocks at one time previous to entering the turning lathe. It will cut off blocks as large as 15″ diameter, 18″ long, in the most accurate manner.

THE FRAME is made of iron and is very strong and durable.

THE SAWS are 36″ diameter, and they are attached to the sides of heavy slip collars, which are fastened to a $2\frac{3}{16}$″ steel shaft with a single countersunk screw in each; by this device the saws can be quickly adjusted to the fraction of an inch; a shield surrounds the saws and protects the operator; the arbor boxes are lined with genuine babbitt metal and accurately fitted.

THE SLIDING CARRIAGE upon which the hub is placed while being operated upon is fitted into planed angle ways, and the saddles supporting the hub are adjustable for the various sizes; a convenient hand lever is used for holding the hub in position and sliding the carriage to and from the saws.

THE COUNTER is furnished, when ordered, as follows: Shaft, $1\frac{15}{16}$″×42″ long; two No. 2 adjustable "J" drop hangers; two $1\frac{15}{16}$″ slip collars; one belt shipper complete; driving pulley, 18″×6″; tight and loose pulleys, 10″×6″; speed, 650 rotations per minute; size of pulley on machine, 12″ × 6″; speed, 1,000 rotations.

HORSE POWER to drive, 3; floor space occupied, 42″×60″.

Solid Steel Hub Reamers,

For Boring or Reaming Hubs.

WE ARE prepared to furnish from our own manufacture a full line of hub boring and reaming tools, made extra heavy for fast feeding, and of a high grade of tool steel to withstand the rapid and heavy labor expected of them.

SOLID STEEL HUB REAMERS, as shown by the engraving, are used for boring hub blocks from the solid, or reaming taper holes to fit the hub lathe mandrel upon which the hub block is turned and converted into the finished hub, or reaming out the chips in the center of hub after the mortising is performed, and they are furnished from $\frac{3}{4}$" to 6" diameter, either with straight cutting edge for boring or reaming straight holes, or with taper edge for boring or reaming taper holes.

IN ORDERING taper reamers, give diameter at each end of the cutting edge and the length between the diameters, in order to determine the taper required; give diameter and length of shank, state if straight or taper; if the latter, give the diameter at each end and length. All reamers to be used in the Defiance Boring or Reaming Machines are furnished with standard taper shank and key seat, excepting sizes below $1\frac{3}{4}$" diameter, which are made with straight shanks 1" diameter, 3" long, and they are used in a chuck which is fitted into the taper hole in the end of boring machine spindle.

SPECIAL SIZES and shapes of any kind of boring tools, as well as hub lathe knives, are furnished promptly and at reasonable prices.

STANDARD HUB REAMERS are carried in stock of the following sizes:

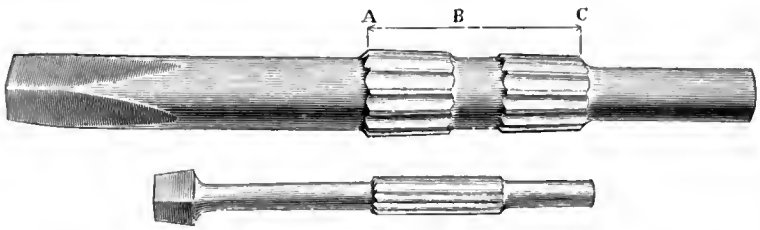
No. 1, $\frac{7}{8}$" diameter at point, $1\frac{1}{4}$" diameter at shank, cutting edge 12" long, shank 1" diameter, 3" long. **Cable Word, REED.**

No. 2, $\frac{7}{8}$" diameter at point, $1\frac{3}{4}$" diameter at shank, cutting edge 16" long, standard taper shank. **Cable Word, REST.**

No. 3, $1\frac{1}{2}$" diameter at point, $2\frac{1}{2}$" diameter at shank, cutting edge 18" long, standard taper shank. **Cable Word, ROVER.**

No. 4, $1\frac{3}{4}$" diameter at point, $3\frac{1}{4}$" diameter at shank, cutting edge 23" long, standard taper shank. **Cable Word, RAY.**

No. 5, $2\frac{1}{2}$" diameter at point, 4" diameter at shank, cutting edge 23" long, standard taper shank. **Cable Word, RIX.**



Hub Lathe Mandrels.

THE VARIOUS SIZES of standard Mandrels are numbered so as to agree with the numbers of Reamers listed above.

No. 1, diameter at A $1\frac{5}{32}$", length B between A and C 4", diameter at C $1\frac{1}{16}$". **Cable Word, MENO.**

No. 2, diameter at A $1\frac{3}{8}$", length B between A and C $4\frac{1}{2}$", diameter at C $1\frac{1}{8}$". **Cable Word, MEXU.**

No. 3, diameter at A $2\frac{1}{8}$", length B between A and C 5", diameter at C $1\frac{7}{8}$". **Cable Word, MOZZA.**

No. 4, diameter at A $2\frac{5}{8}$", length B between A and C $6\frac{3}{4}$", diameter at C $2\frac{5}{16}$". **Cable Word, MIMOZ.**

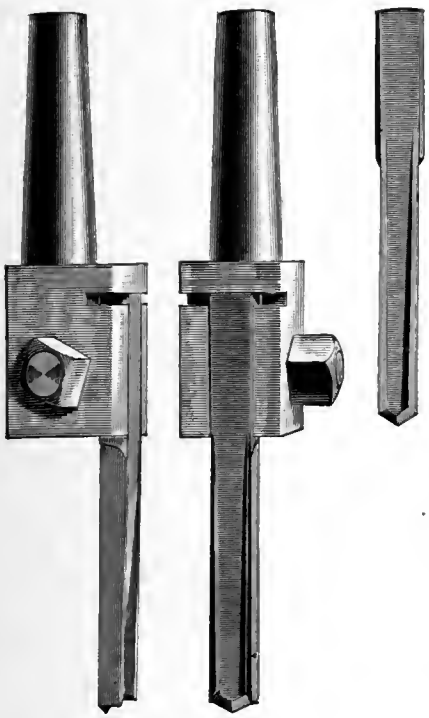
No. 5, diameter at A $3\frac{3}{8}$", length B between A and C 10", diameter at C $2\frac{3}{4}$". **Cable Word, MOLOLE.**

ALL SIZES have bronze bush centers containing reservoirs for lubricant. We also furnish special devices for holding checked hubs in the hub lathe.

Twist Hub Augers.

Cable Word, BADEN.

TWIST HUB AUGERS, as shown by the engraving, are furnished in any diameter up to $2\frac{1}{2}$" and different lengths, usually with shank 1"×3", or other sizes when desired, either straight or taper, and they are used principally for boring a straight hole in the center of the hub block previous to being seasoned, and are largely used by the makers of elm blocks for carriage and wagon wheel hubs.



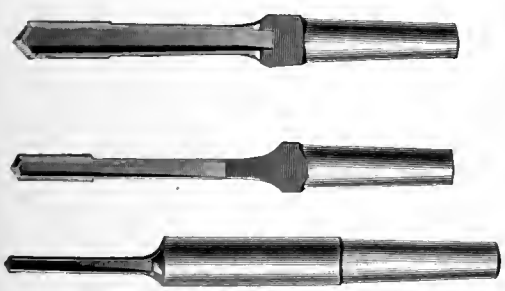
Mortising Machine Stocks and Chisel Points.

Two Sizes, Nos. 1 and 2.

No. 1 Cable Word, CENTRAL.
No. 2 Cable Word, CENT.

This engraving represents an improved method of constructing Mortising Machine Chisels, and it is highly recommended for the lighter kinds of work, as it is much stiffer than the old style chisel. The stock which holds the chisel is placed into the machine in the usual way and when once set requires no further adjustment; the chisel point is fitted to it in a milled taper slot and locked into position with a friction binder. In changing from one sized mortise to another it simply requires changing the chisel point by loosening one screw, and avoids lining up the chisel at each change, and the cost of chisel points is much less than the common chisels. They are furnished for single or double Chisel Mortising Machines.

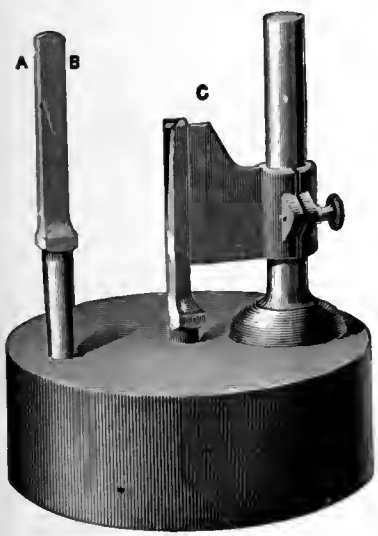
No. 1 size to hold Chisels from $\frac{1}{4}''$ to $\frac{3}{8}''$.
No. 2 size to hold Chisels from $\frac{7}{16}''$ to $\frac{1}{2}''$.



Mortising Machine Chisels.

Cable Word, COUNT.

We keep in stock a full line of standard Mortising Machine Chisels, made to standard gauges, and from the finest quality of steel, varying in size from $\frac{3}{16}''$ to $2''$ in width, each having proper clearance, temper and finish. Chisels with odd sized shanks and special blades made to order.



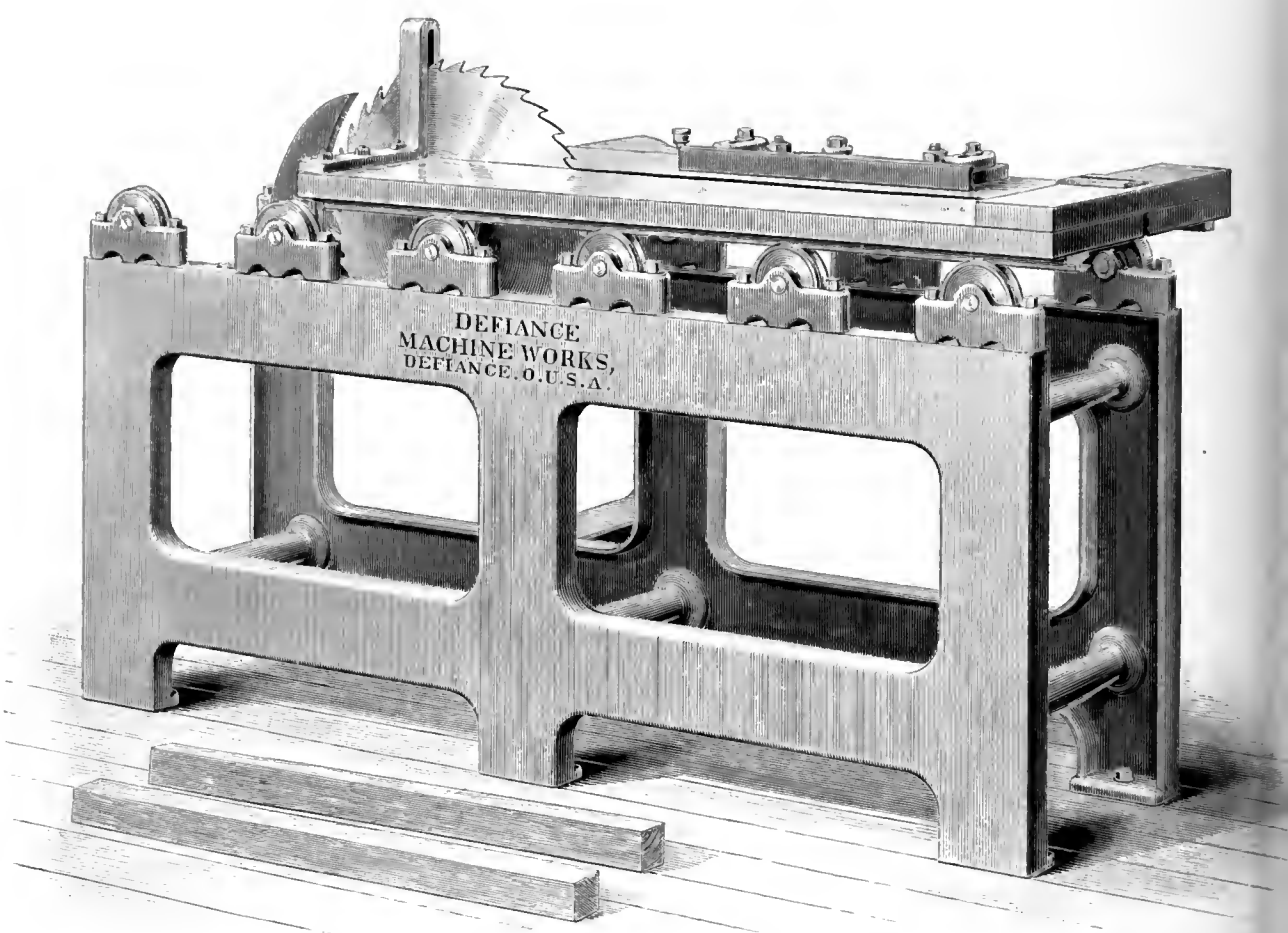
Mortising Machine Chisel Tester.

Cable Word, CANARD.

We take pleasure in presenting to the trade a new device for ascertaining with accuracy the exact condition of chisels used for mortising. The breaking of chisels is caused generally by their being out of truth; furthermore, perfect mortising cannot be accomplished with untrue chisels.

The accompanying cut represents a device by the use of which the operator can in a moment's time test and correct them.

The taper of the sides of chisels at A and B, as shown by the engraving, should be at the rate of one hundredth of an inch in four inches. The taper of the back at C should be at the rate of one hundredth of an inch in four inches for the first inch from the point, and the taper of the balance of the back should be at the rate of one hundredth of an inch to the inch.



No. 1 Improved Spoke and Handle Blank Saw.

Export Shipping Weight, 1,700 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 83 Feet.

Cable Word, SERVIA.

No. 1 Improved Spoke and Handle Blank Saw.

Export Shipping Weight, 1,700 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 83 Feet.

Cable Word, SERVIA.

THIS ENGRAVING represents our No. 1 Improved Spoke and Handle Blank Saw, which has been designed for the use of spoke and handle makers to saw spoke and handle blanks from the plank; also for sawing rived stock, and ripping bent hames by the use of special dogs for holding the material. It will saw the material either parallel or tapering, cutting from the shortest length up to 42″ long.

IT IS a rapid labor and stock saving machine. Spokes and handles are usually larger at one end than at the other, and in cutting them tapering, it not only effects a saving in material, but enables the turning lathe to reduce them to the finished product much more rapidly.

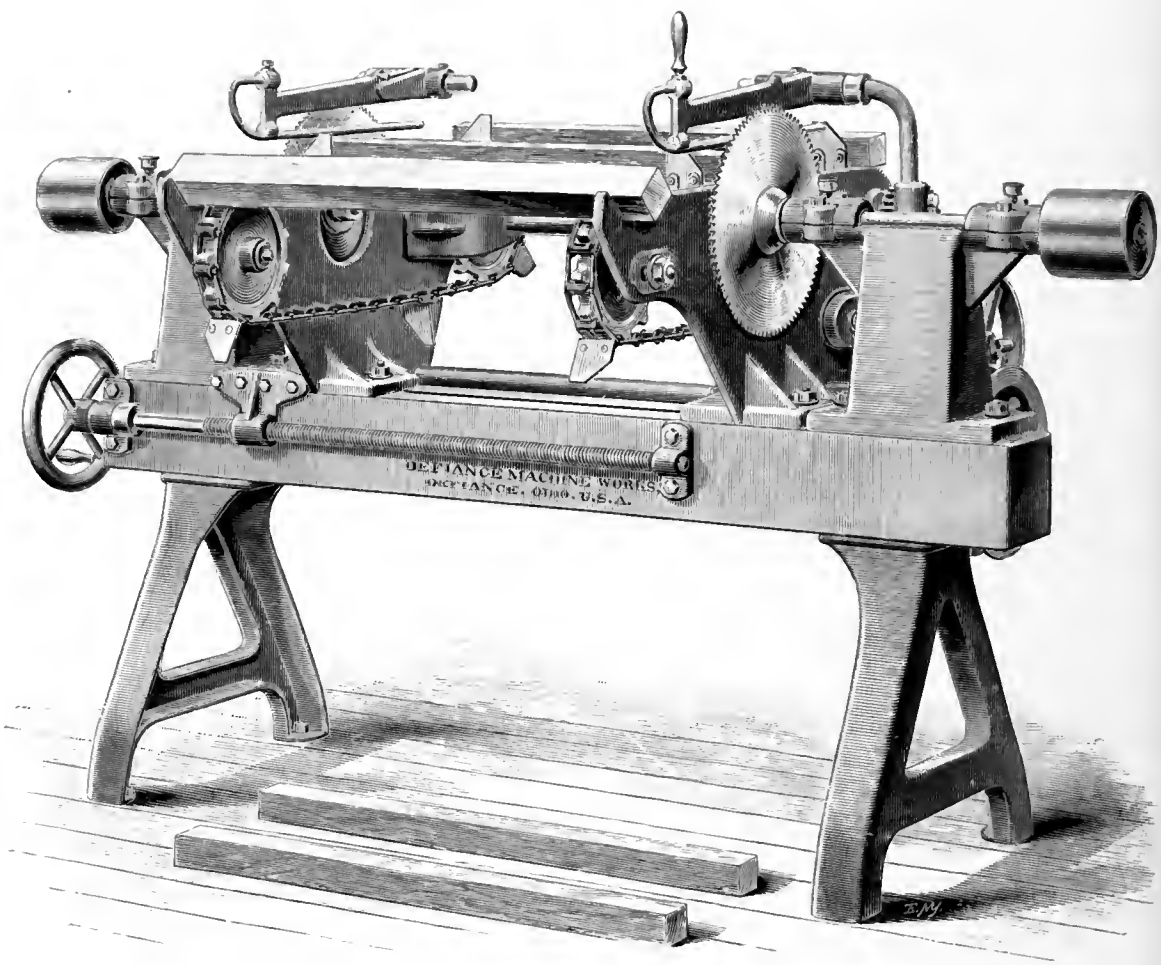
THE FRAME is a heavy casting of neat design. The top is planed true to receive the anti-friction rollers, which rotate in roller bearings, which allows the table to ride to and from the saw with the greatest ease.

THE SAW ARBOR, of steel, $1\frac{1}{8}$″ diameter, runs in three heavy connected genuine babbitt metal bearings, with a pulley 6″ × 8″ attached to the outer end. The saw is 18″ diameter.

THE TABLE is of iron and provided with an adjustable gauge for cutting different widths and tapers, and suitable spurs for holding the material. It is so conveniently arranged that defective parts of stock can be cut out, and, with the traveling table, only one operator is required.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}$″ × 40″; two No. 2, 14″ drop hangers; driving pulley, 24″ × 6″; tight and loose pulleys, 14″ × 6″; speed, 500 rotations per minute.

HORSE POWER to drive, 3; floor space occupied, 52″ × 72″.



No. 3 Patent Automatic Double Equalizing Machine.

Export Shipping Weight, 3,300 Pounds.

Net Weight, 2,300 Pounds.

Cubic Measurement, 222 Feet.

Cable Word, ESQUIMAUX.

No. 3 Patent Automatic Double Equalizing Machine.

Export Shipping Weight, 3,300 Pounds.

Net Weight, 2,300 Pounds.

Cubic Measurement, 222 Feet.

Cable Word, ESQUIMAUX.

THIS ENGRAVING represents our No. 3 Patent Automatic Double Equalizing Machine, especially designed for sawing off at one operation both ends of spoke, handle, neck-yoke, and single-tree blanks, and other similar work where exact lengths are required, and preparing the same for the turning lathe.

THIS MACHINE has the largest capacity obtainable, doing about four times more work than the ordinary type of equalizing machines. It is substantially built and will not get out of order, and it can be adjusted while in operation for various lengths of work. It is calculated to cut varying from 10″ up to 6 feet long.

THE FRAME is a heavy casting with cored center with a broad floor support. The top is planed true, with the working parts accurately fitted to it.

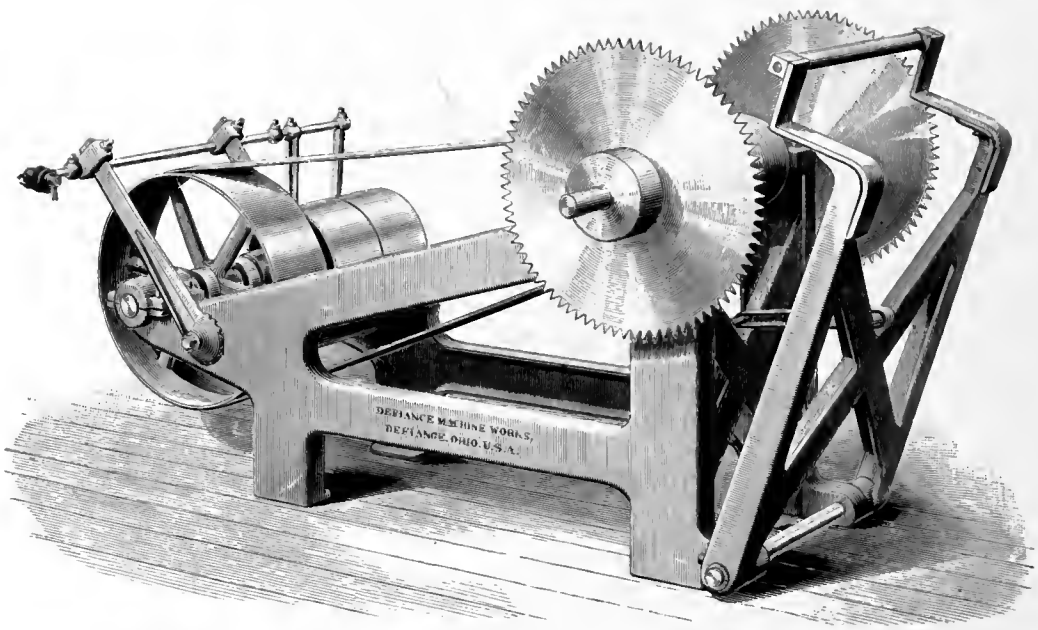
THE SAWS are 12″ diameter and are fitted to heavy steel spindles running in self-lubricating bearings. The saw at the left hand end of the machine and its feed bracket can be quickly adjusted by hand wheel and screw horizontally to equalize from 10″ up to 6 feet without stopping the machine.

THE FRICTION FEED is rapid and positive and so constructed that it can be started and stopped at the will of the operator while the saws are in motion.

THE OPERATOR has complete control over the machine from the working side. A boy can handle it successfully and make all the necessary adjustments. The material to be operated upon is simply placed upon the feeding brackets, the chain feeding it to the saws, and discharging it automatically at the rear side of the machine after the work is finished.

THE COUNTER is furnished as follows: Shaft, $1\frac{5}{8}'' \times 114''$ long; three No. 2 ball and socket adjustable drop hangers; one driving pulley, 16″ diameter, 40″ face; one driving pulley, 16″ diameter, 5″ face; pulley for feed, 7″ diameter, 3″ face; tight and loose pulleys, 12″ diameter, 6″ face; speed, 900 turns per minute.

HORSE POWER to drive, 2; floor space occupied, $48'' \times 108''$.



No. 4 Improved Double Equalizing Machine.

Export Shipping Weight, 1,300 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 69 Feet.

Cable Word, SMOOTH.

No. 4 Improved Double Equalizing Machine.

Export Shipping Weight, 1,300 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 69 Feet.

Cable Word, SMOOTH.

THIS MACHINE, as shown by the accompanying engraving, is used for cutting off both ends of spoke and handle material at one operation, reducing same to equal lengths and preparing it for the lathe.

THE WORKING PARTS are mounted upon a substantial iron frame with an attached counter at the rear end, which can be belted to from above or below direct from the main line shaft.

THE SAWS are 20″ diameter, adjustable to cut material from 22″ to 32″ in length; they are attached to the side of slip collars, which are fastened to a $1\frac{9}{16}$″ hammered steel arbor, and they are secured to it with countersunk screws. By this simple device the saws can be quickly adjusted to the fraction of an inch, furnishing any adjustment within the capacity of the machine without loss in time.

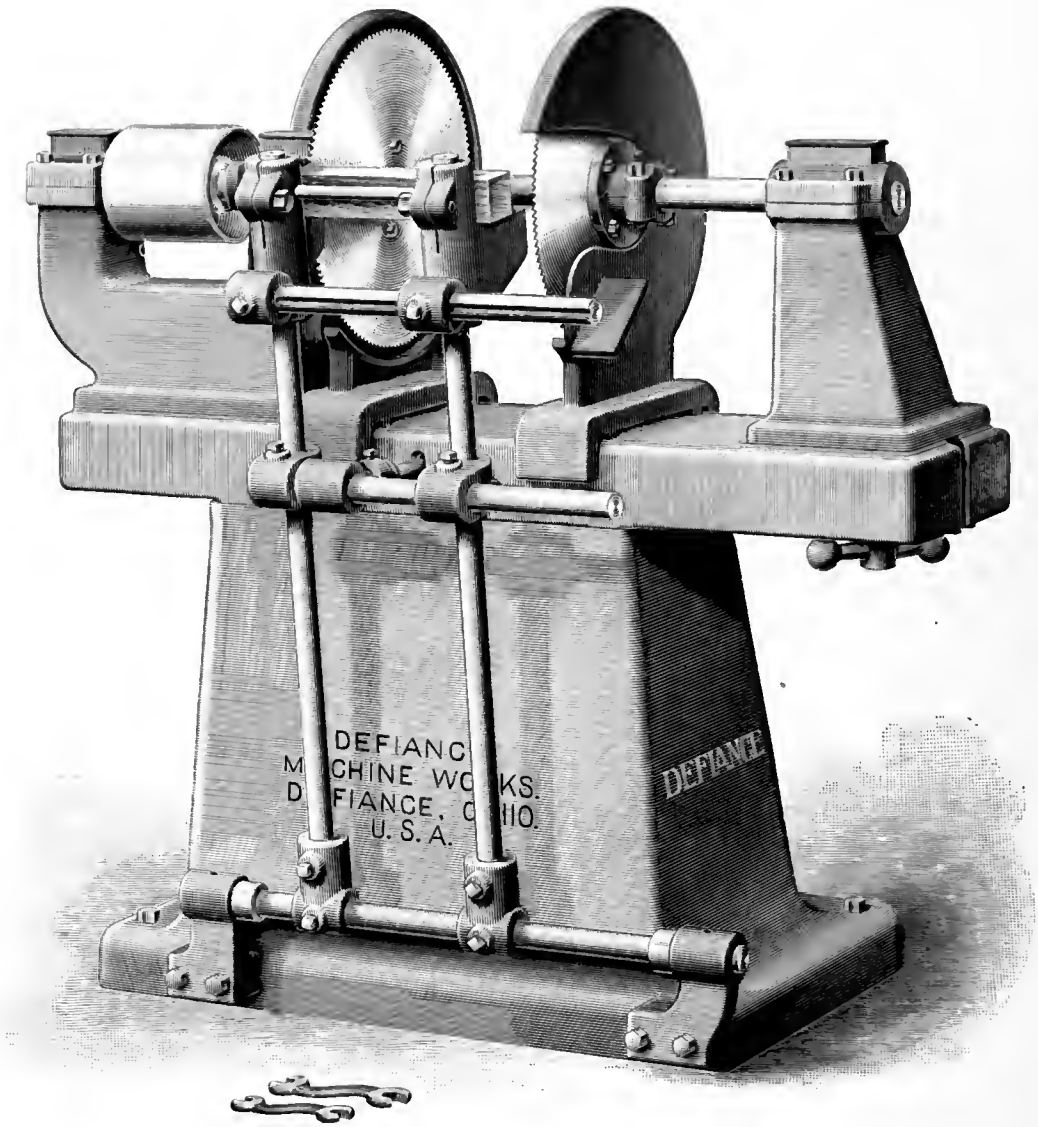
THE BEARINGS are fitted with genuine babbitt metal, each supplied with a large self-oiling chamber at the bottom; in addition self-regulating glass oilers are furnished.

THE SWINGING CARRIAGE which supports the material while being operated upon is hinged at the bottom of the frame upon a steel shaft which extends entirely through the main frame, making a substantial connection entirely free from lateral motion, enabling the material to be cut off quickly without cramping between the saws.

THE TIGHT AND LOOSE PULLEYS are 10″ × 6″ and should run 500 rotations per minute; with the counter as a portion of the machine it can be set in position with very little expense.

EACH MACHINE is furnished with one pair of saws, set, filed, and ready for use, also necessary wrenches and oil cups.

HORSE POWER to drive, 1½; floor space occupied, 41″ × 70″.



No. 6 Improved Double Equalizing Machine.

Export Shipping Weight, 1,850 Pounds.

Net Weight, 1,500 Pounds.

Cubic Measurement, 57 Feet.

Cable Word, SENJEN.

No. 6 Improved Double Equalizing Machine.

Export Shipping Weight, 1,850 Pounds.

Net Weight, 1,500 Pounds.

Cubic Measurement, 57 Feet.

Cable Word, SENJEN.

THIS ENGRAVING represents our new No. 6 Improved Double Equalizing Machine, designed for reducing spokes, handles, and other blanks to exact lengths and prepare them for the turning lathe. The saws can be quickly adjusted to cut from 7″ up to 18″ long and as heavy as 5½″ thick.

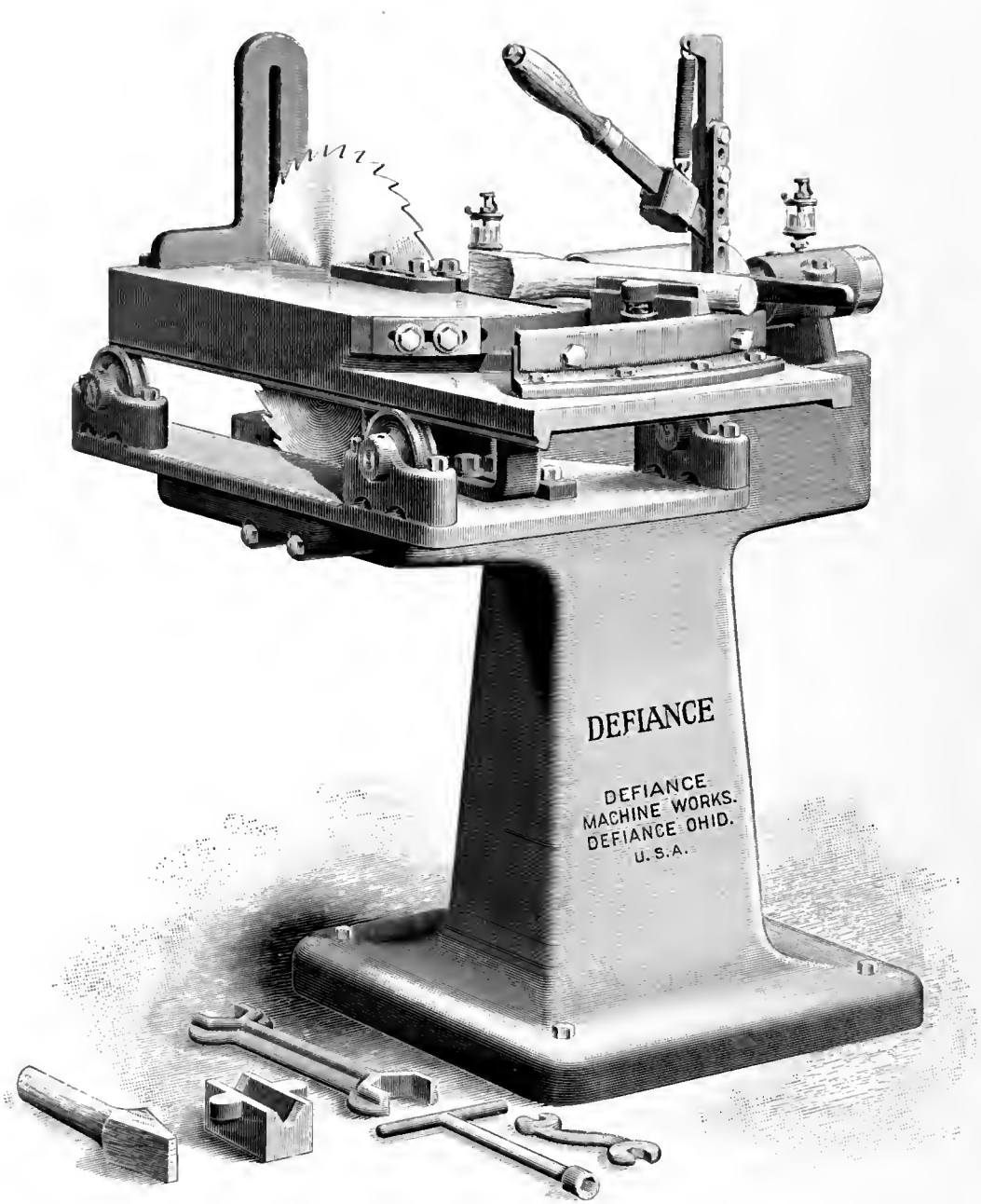
THE WORKING PARTS are mounted upon a neat iron frame cast in one piece, with a broad floor base to stand firm, and of sufficient strength to overcome all tendency to twist or spring.

THE SAWS are 16″ diameter and fitted to a heavy ground steel spindle, and they are locked in position by a friction binder which prevents marring the shaft and enables the saws to be quickly set for different lengths of work. They are surrounded with safety guards to protect the operator and they are adjustable on the frame of the machine with the saws. The saw arbor bearings are fitted with genuine babbitt metal; they are extra long and self-lubricating. The bearing at the right can be quickly removed by loosening a single screw to place on or take off the saws.

THE SWINGING CARRIAGE which supports the material to be equalized is hinged at the bottom of the frame upon a steel shaft extending the full width of the frame, making a substantial hinge joint entirely free from lateral motion, overcoming the liability of cramping the material between the saws. It is provided with a quick adjustment for different lengths of work.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}$″ × 48″; two No. 2 adjustable J drop hangers, with self-oiling boxes; one driving pulley, 24″ × 6″; tight and loose pulleys, 12″ × 6″, with the loose pulleys fitted with self-oiling, loose bronze rings; speed, 550 turns per minute.

HORSE POWER to drive, 2; floor space occupied, 30″ × 53″.



No. 50 Automobile Spoke Miter Saw.

Export Shipping Weight, 1,350 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 39 Feet.

Cable Word, SANGALAK.

No. 50 Automobile Spoke Miter Saw.

Export Shipping Weight, 1,350 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 39 Feet.

Cable Word, SANGALAK.

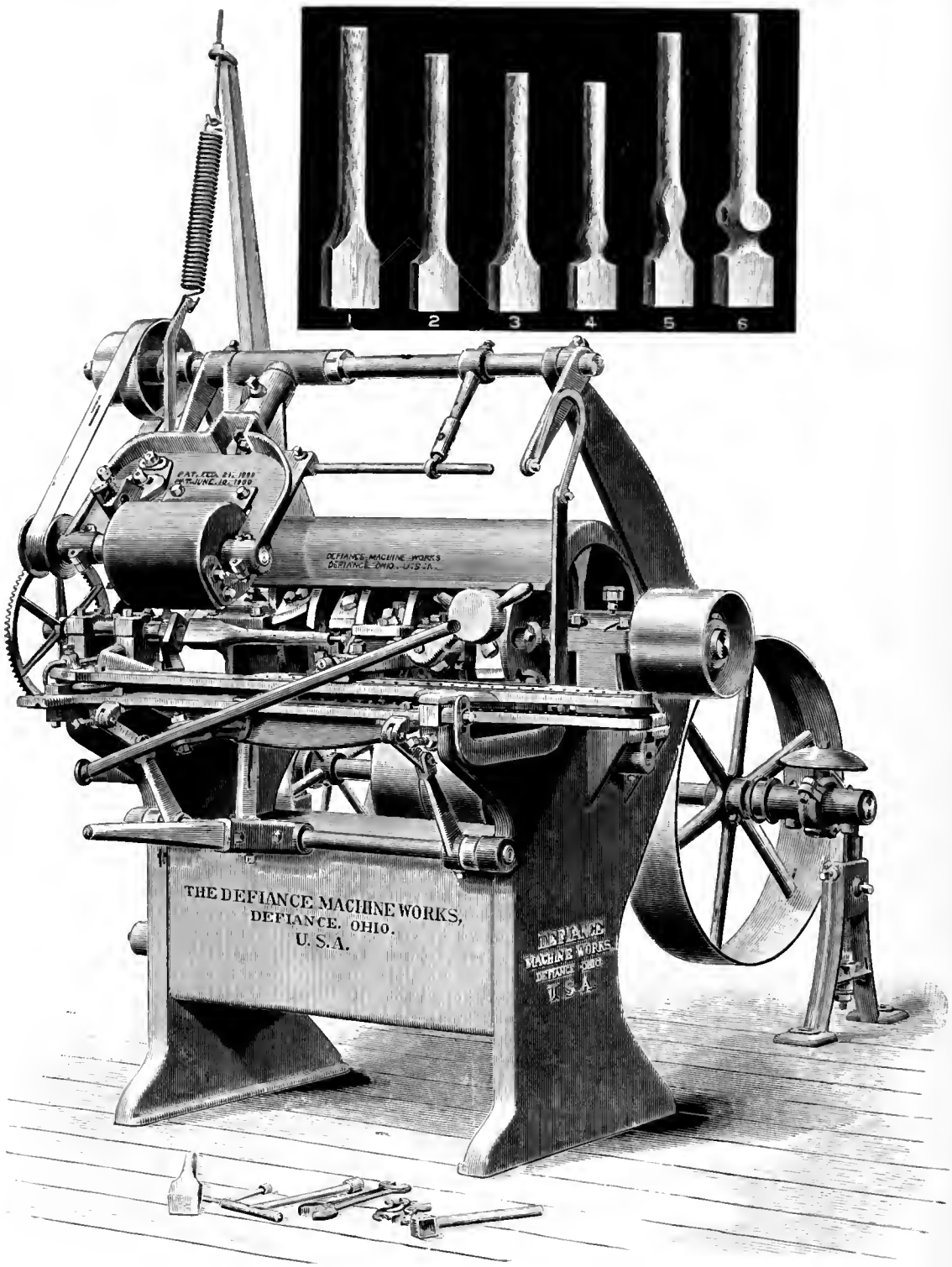
THIS ENGRAVING represents our No. 50 Automobile Spoke Miter Saw designed for sawing off the surplus stock of the miter or hub end of automobile and artillery spokes, roughing the same out and preparing them for the mitering machine. By the use of this machine only a small surplus is allowed for the finishing cut. Consequently smooth and true work can be secured and without the liability of knocking off the corners or edges of the spokes. It is powerfully belted and it will handle the heaviest work with ease.

THE TABLE is mounted upon a heavy iron pedestal and it travels upon wheels with roller bearings, giving it an easy, steady motion. The upper portion is equipped with an ingenious device for holding the spoke at the proper position with the saw without any care on the part of the operator. It is so arranged to adjust the spoke to a scale for any taper desired. Both sides of the spoke are sawed at one setting by a radial movement of the device from right to left for each cut, always cutting the miters to the exact size and taper and true with the barrel as the spoke is centered by the barrel between a V-shaped clamp and firmly held in position by a convenient hand lever which is also used for sliding the table. In holding the spoke by this method, should it be sprung, it will divide up the amount.

THE SAW is 16″ in diameter, fitted to a heavy ground steel arbor rotating in long self-lubricating bearings and driven by a 6″ belt.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}$″ × 48″; driving pulley, 24″ × 6″; two No. 2 ball and socket adjustable drop hangers; tight and loose pulleys, 12″ × 6″; speed, 460 rotations per minute. The loose pulley is fitted with bronze bearings.

HORSE POWER to drive, 4; floor space occupied, 42″ × 42″.



24″ Patent Automobile Spoke Turning Lathe.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 2,400 Pounds.
Cubic Measurement, 97 Feet.
Cable Word, LARIEO.

24″ Patent Automobile Spoke Turning Lathe.

Export Shipping Weight, 2,900 Pounds.

Net Weight, 2,400 Pounds.

Cubic Measurement, 97 Feet.

Cable Word, LARIEO.

THIS ENGRAVING represents our 24″ Patent Automobile Spoke Turning Lathe, especially designed for rapidly producing automobile spokes. It receives the rough stock, either split or square, after it has been equalized to length, and performs the turning of the barrel, squaring of the head, and throating the spoke complete, as shown by the accompanying engraving, performing the three operations at one and the same time, at the rate of about 2,500 spokes in ten hours.

BY THIS MODERN PROCESS of turning, throating, and squaring the spoke at one operation the work is always uniform, the squaring and throating are true with the barrel of the spoke, consequently the tenoning can be performed with the same degree of accuracy, and the spokes will always register alike when placed into the hub, which is an exceedingly important feature in good wheel making.

THIS AUTOMATIC MACHINE can be handled by an inexpensive operator and absolutely correct work secured. It performs the turning smooth and true, entirely free from knife marks, so that a very small amount of finishing is necessary on a fine polishing belt. It will produce spokes from the very smallest sizes up to 5″ diameter and in the different lengths up to 24″ long.

THE FRAME of this machine is a massive casting with cored center and a broad floor base to stand firm. It is exceedingly well designed to stand the rapid work expected of it.

THE CUTTER HEADS each contain three cutters, and a sufficient number are used to cover the entire length of the longest spoke turned. They are placed side by side upon a heavy steel spindle running in long self-lubricating bearings. All cutters have straight cutting edges excepting those which have curved faces for doing the throating, and turning the lug. They can all be easily removed from the heads, reground and replaced when sharpening is necessary by simply placing a wooden templet furnished for that purpose between the centers of the machine, and each cutter accurately set to it. By using so many cutters, regrinding is seldom necessary, as each cutter performs a small amount of work, and simply whetting the cutting edges with an oil stone once each day is generally sufficient in turning the hardest wood.

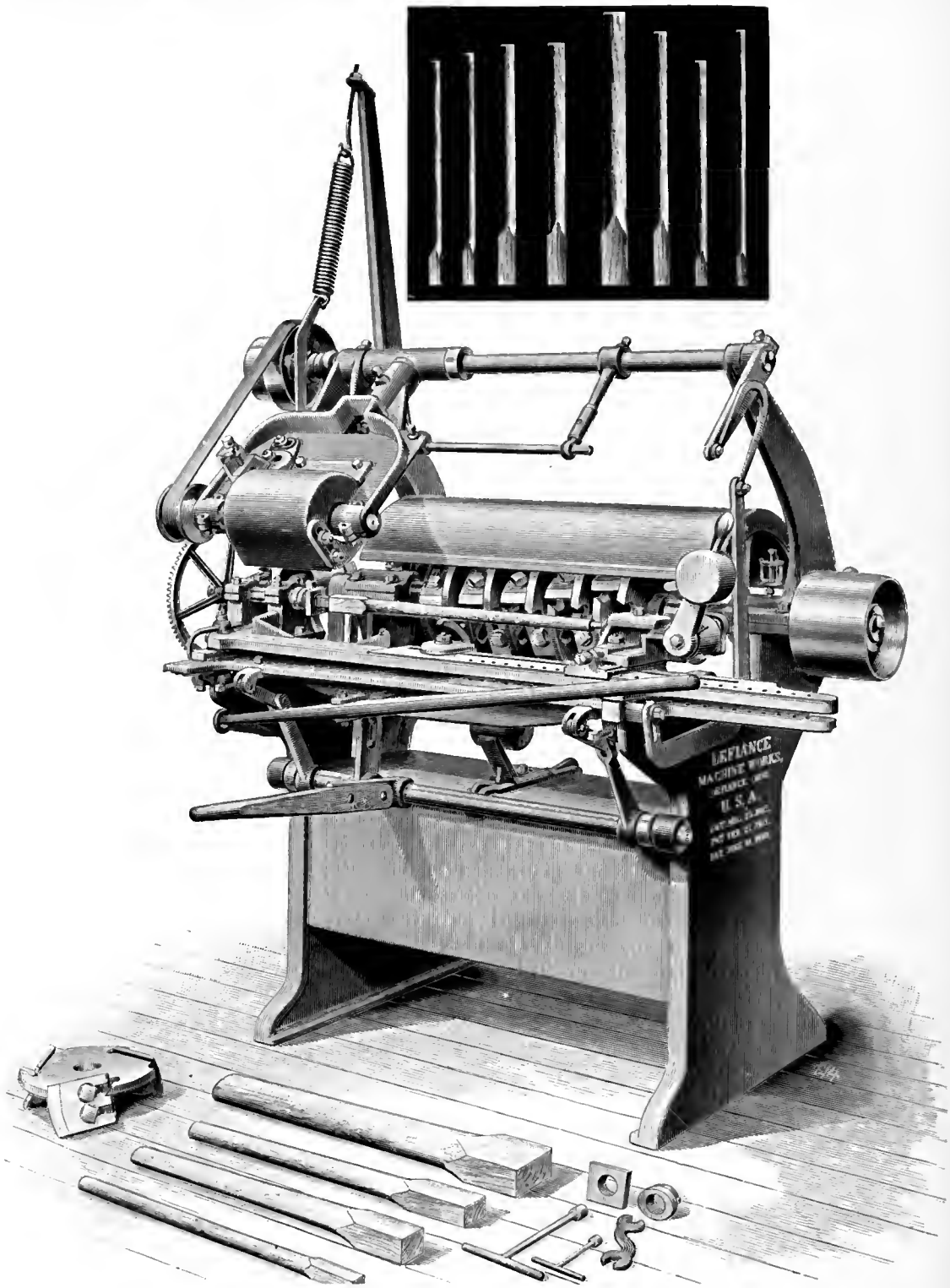
THE TABLE supporting the centers is constructed in two parts, upper and lower. The lower half is gibbed to and slides upon the main frame to and from the cutter heads by moving a convenient hand lever, as shown. The spur center spindle is provided with two cams or patterns, one of the same shape of the barrel of the spoke to be turned, and it revolves against a cam shoe attached to the lower half of the table, and, as it rotates against the shoe, the spoke is oscillated against the cutters in a path corresponding to the shape of the cam used, and the turning is therefore performed according to the shape of the cam. The second cam is square or to the shape of the square end of the spoke and it governs the path in which the swinging cutter head travels. These cams or patterns are inexpensive and they can be quickly placed on or off the spindle as they are held in position by a single screw. The diameter of the turning can be instantly changed by adjusting two screws underneath the table, and the tail stock can be quickly adjusted horizontally on the table for spokes of different lengths. It is also provided with a right-angular adjustment to turn the barrel of the spoke tapering or parallel.

THE SWINGING CUTTER HEAD for squaring the head of the spoke is automatic in its movement, advancing to or retreating from its work as the table is moved to and from the cutter heads, and, by the adjustment of a single screw, it will make the square of the spoke large or small, parallel or tapering. A shield surrounds the cutters and thoroughly protects the operator.

THE SPOKE BLANK is placed between the centers in the usual way, and, when the table is moved up to where the turning shall begin, the blank slowly rotates against the cutters, and turns its full length at one time. At the same time, the swinging cutter head goes down and squares the head of the spoke. When the table is moved back to remove the finished spoke, the swinging head is automatically lifted out of the way, and the rotation of the spoke is also automatically arrested.

THE COUNTER is furnished as follows: shaft, $2\frac{3}{16}$″ by 72″; two No. 2 ball and socket adjustable drop hangers fitted with improved belt shipping apparatus; one driving pulley, 30″ by 6″; tight and loose pulleys, 14″ by 6″, with the loose pulley fitted with bronze bearings; speed, 600 turns per minute.

HORSE POWER to drive, 3½; floor space occupied, 36″×48″.



32″ Patent Automatic Spoke Lathe.

Export Shipping Weight, 3,100 Pounds.
Net Weight, 2,450 Pounds.
Cubic Measurement, 105 Feet.

Cable Words: 32″ Machine, LONDON; 38″ Machine, LOYAL;
42″ Machine, LOWELL; 48″ Machine, LIVERPOOL;
52″ Machine, LASTING; 58″ Machine, LOVING.

32″ Patent Automatic Spoke Lathe.

Export Shipping Weight, 3,100 Pounds.
Net Weight, 2,450 Pounds.
Cubic Measurement, 105 Feet.

Cable Words: 32″ Machine, LONDON; 38″ Machine, LOYAL;
42″ Machine, LOWELL; 48″ Machine, LIVERPOOL;
52″ Machine, LASTING; 58″ Machine, LOVING.

THE PATENT 32″ AUTOMATIC SPOKE TURNING AND SQUARING MACHINE, as described by the accompanying engraving, is built in six sizes, to turn spokes 32″, 38″, 42″, 48″, 52″ and 58″. It is the most useful of all modern spoke machines, arranged for turning every variety of spokes known to the trade, including Common, Sarven-Patent and Sharp-edged.

THESE MACHINES have a capacity for turning and squaring 2,500 spokes complete in ten hours, performing the work smoothly so that little polishing is required, producing the work for one half the cost over any other machine and in a much more satisfactory manner.

THE CUTTER HEADS are large in diameter, secured to the spindle by friction grip, no set screw points coming in contact to mar the spindle, each accurately balanced to run true without the slightest vibration.

THE KNIVES are flat shear cutting, their edges ground straight over; three knives attached to each head. The edges of knives used to form the throat or neck of spoke are shaped to suit the style of spoke desired. Two sets of throat knives for Common and Sarven-Patent Spokes are furnished with each machine. The knives can be quickly ground and reset. A wooden straight-edge placed between the centers should be used, setting each knife so as to form a straight line.

A SHIELD, hinged to the back end of frame, surrounds the heads, preventing any possible chance for the operator to become injured, and discharging dust and shavings at the back portion of the machine.

THE TABLE is made in two parts, each planed and scraped to a perfect bearing. The one resting upon the frame slides upon angle ways provided with gibs, operated to and from the cutter-heads by hand lever. Two adjusting screws, one at each end underneath the table, working against stops attached to frame, are used for regulating the diameter of spokes, thus one-sized cam is used for turning several sized spokes of the same shape. The tables are coupled together at tail center end by a steel pin in one of the several holes which extend through both tables. As the cam revolves against the upright shoe attached to lower table, the upper table vibrates to and from the cutter heads according to shape of cam which governs shape of spoke. By placing the pin connecting tables directly opposite tail center, the tread end of spoke will be turned round with a gradual change in shape to the throat, at which point the shape of cam and spoke agree. Placing the pin towards the right-hand end of table increases the oblong shape at tread end of spoke.

SHARP EDGE SPOKES are turned with a special attachment to turn both throat and tread end alike, forming a straight line on sharp edge.

THE TAIL BLOCK can be quickly adjusted to the desired distance from the head center for short or long turning; can be set in alignment with the head center or at either side, thus turning a spoke parallel or to any taper desired.

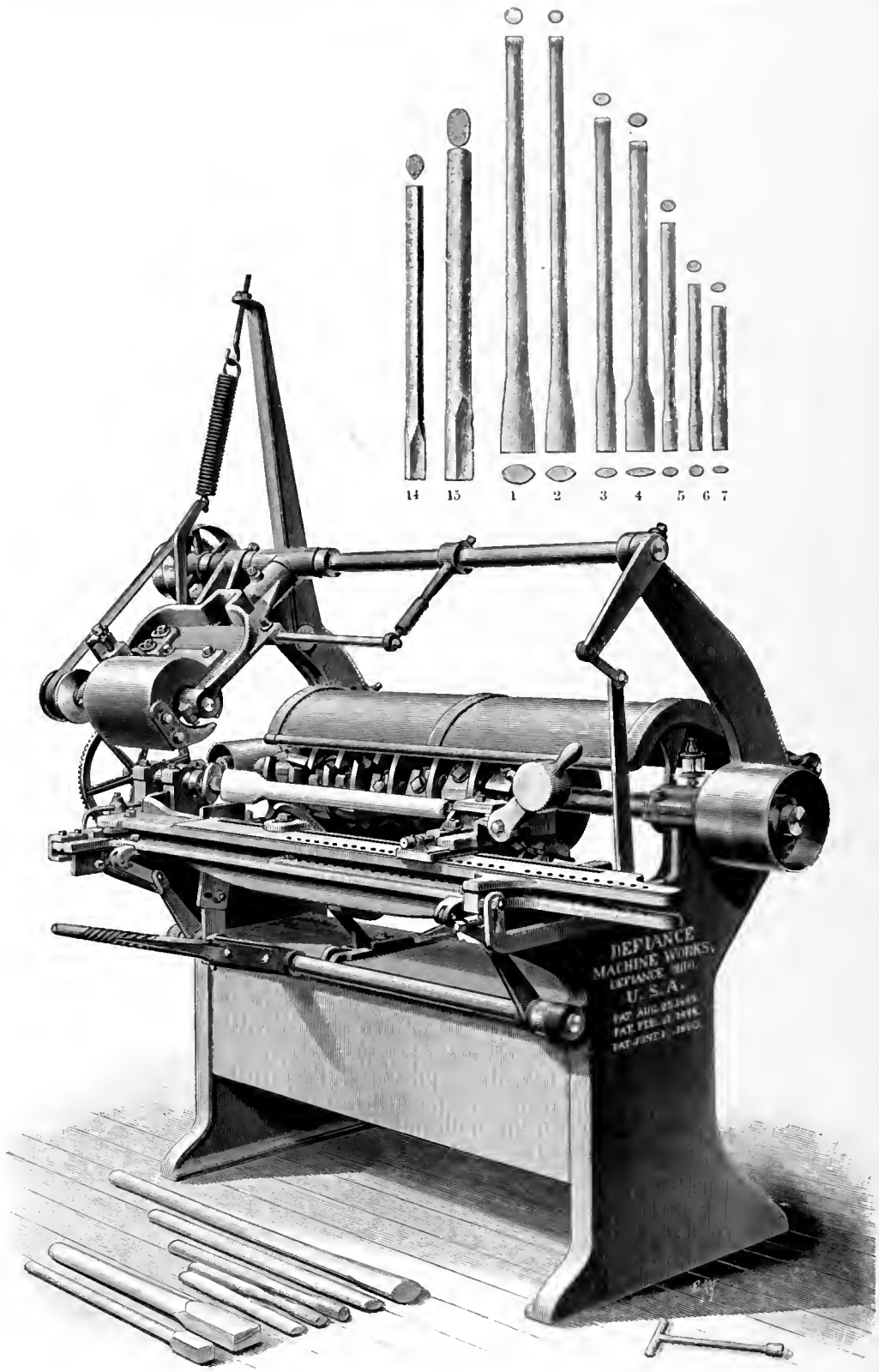
THE SQUARING HEAD advances and retreats from the spoke automatically, forming the square of spoke to agree with shape of cam, which is attached to spur center spindle. The squaring knives cover 9″ in length. A shield surrounds the head excepting a small space on working side.

THE OPERATION is simple, requires no expensive help. Rived or sawed timber requires no hewing or other preparing, taken just as it comes, placed in the lathe, reduced to proper size and shape, finished complete at one and the same operation. In changing from one style of spoke to another requires but a moment's time to loosen two set screws and change the cams. These are inexpensive, made of cast iron, and can be shaped with a file to best suit the requirement.

SPEED OF CYLINDER is 2,250 revolutions per minute.

COUNTERSHAFT should run 600 revolutions per minute. Size of pulley on spindle, 8″×6″; driver, 30″×6″; tight and loose pulleys, 14″×6″; pulley for driving squaring attachment, 18″×3″; countershaft, $2\frac{3}{16}$″×6′; two No. 2 hangers.

HORSE POWER to drive, 4; floor space occupied, 36″×60″.



42″ Patent Automatic Combined Spoke and Handle Lathe.

Export Shipping Weight, 4,150 Pounds.
Net Weight, 3,350 Pounds.
Cubic Measurement, 124 Feet.
Cable Word, LEHIGH.

42″ Patent Automatic Combined Spoke and Handle Lathe.

Export Shipping Weight, 4,150 Pounds.
Net Weight, 3,350 Pounds.
Cubic Measurement, 124 Feet.
Cable Word, LEHIGH.

THIS AUTOMATIC MACHINE is used for turning and squaring spokes for wagon and carriage wheels, having necessary adjustments to turn Common, Sarven-Patent or Sharp-edged shapes, making either light hickory spokes or heavy spokes for wagon, truck and artillery wheels, up to 6″ diameter, 42″ long at the largest, covering every requirement for rapidly and accurately producing spokes of every variety and size, as represented by the samples shown in the engravings Nos. 14 and 15. Different sized machines can be furnished to turn from 24″ to 58″ long.

IT IS furnished when required with extra cutter heads and cams for turning round and oval single-trees, hammer, hatchet, maul, railroad and mining pick handles and double bitted ax helves. Engraving No. 1 represents a heavy railroad pick handle; No. 2, standard pick handle; Nos. 3 and 4, two varieties of mining pick handles; Nos. 5 and 6, hammer handles; No. 7, hatchet handle. All the above work can be produced on one machine by changing heads and cams. Or it is furnished for turning any one of the above samples.

THE BODY OF THE MACHINE, supporting the working parts, is a massive casting in one piece, having cored center and broad base, and it is very stiff and reliable.

THE CYLINDER is composed of a sufficient number of cutter heads placed side by side upon a 2¼″ steel spindle to fill the length of turning. Each head is provided with three cutters which lap over each other on either side, forming a continuous cutting edge over the entire length of cylinder, to turn the full length at one cut. The heads are secured to the spindle by a friction binder.

THE TABLE is constructed in two parts, and it is gibbed to and slides upon the frame in angle ways; it is moved to and from the cutters by a convenient hand lever; the upper portion supporting the centers is pivoted to the lower half near the tail center by a steel pivot, in one of the several holes through the table, upon which it vibrates for oval turning. At the opposite end on the head center spindle a cast-iron cam is placed of whatever shape desired to turn, the cam rides against an upright shoe extending up from the lower table, and is held snug against the shoe by a coiled spring. When the table is moved toward the cylinder to where the turning shall begin, an automatic feed slowly rotates the object to be turned, and the cam revolving against the shoe oscillates the upper table in a path corresponding with the shape of cam. When the pivot is placed directly opposite the tail center, the machine will turn the material round at the tail center end with a gradual change in shape toward the opposite end, at which point the turning will agree with the shape of cam. When both ends are required to agree in shape, the vibrating table is locked to the lower table, with the cam revolving against a shoe fastened to the frame, thus vibrating both tables alike at each end. The diameter of turning is regulated with graduating screws, having adjustments sufficient to turn work from ½″ to 6″ diameter.

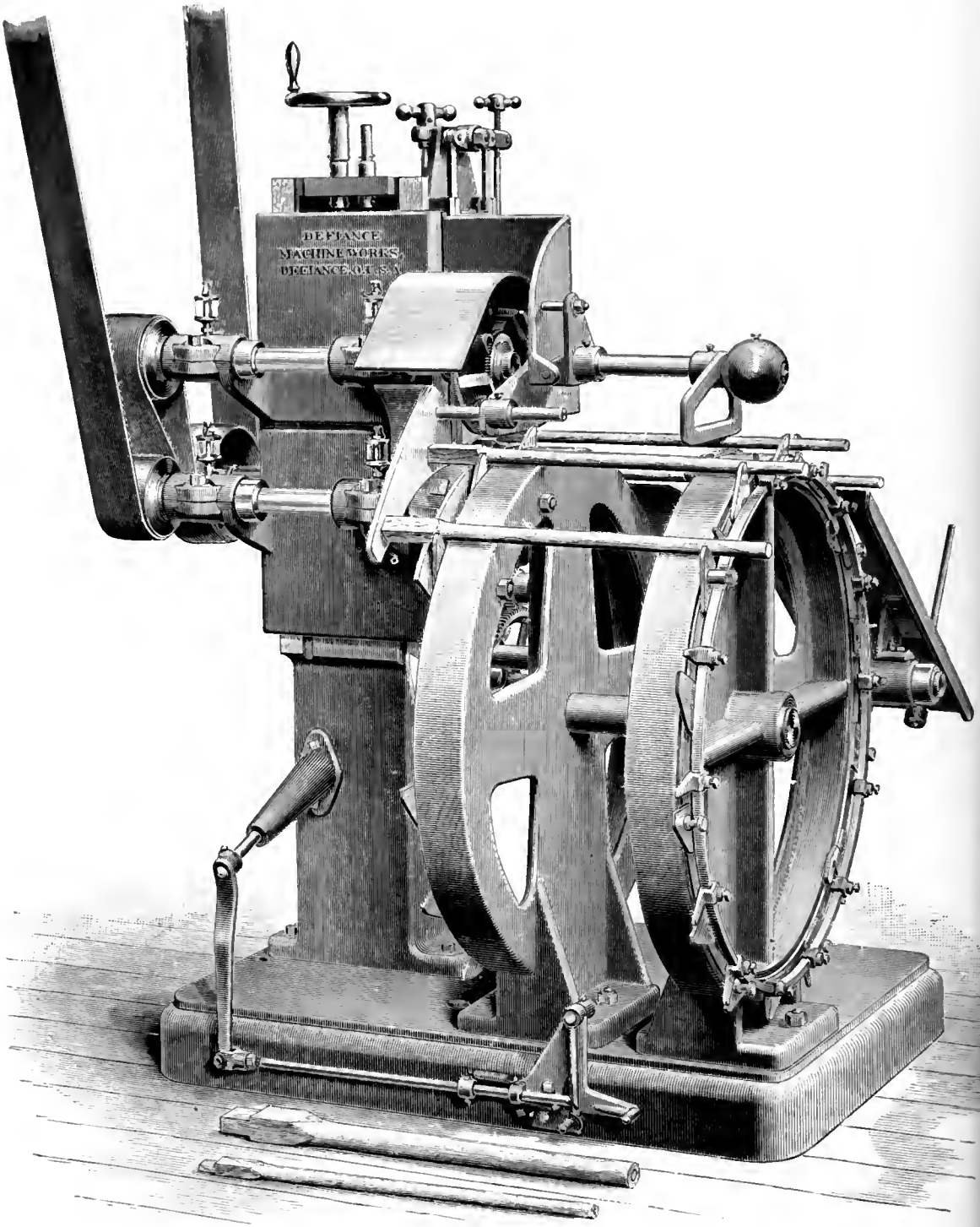
THE TAIL CENTER can be quickly adjusted to the desired distance from the spur center for short or long turning, or at right angles for straight or taper turning.

THE SWINGING CUTTER HEAD advances and retreats from the work automatically; its position is governed by the movement of the table; it is brought down to its work at the same time the turning commences, and when the table is moved backward to remove the turned material from the centers, it is lifted out of the way by a spring balance; its action upon the turning is governed by a cam upon the live center spindle, and it will follow the path of either a square cam for squaring the head of spokes, or oval, oblong, hexagon or octagon shapes suited to finishing the eye end of handles, having the necessary adjustments to turn tapering in either direction, as well as the different diameters.

THE OPERATION of this machine is very simple; no expensive labor is required; the rough blank, either sawed or rived, is placed between the centers and when presented to the action of the cutters revolves slowly and is turned its full length at one time, very smooth and to exact shape, requiring little if any finishing after leaving the machine. The material is placed into and removed from the machine without stopping. The cams and cutter heads are numbered, rendering changes from one class of work to another simple and easy to effect.

THE COUNTER should run 600 rotations per minute. T and L pulleys, 14″ × 6″; driver, 30″ × 6″; pulley for driving squaring attachment, 18″ × 3″; countershaft, 2$\frac{3}{16}$″ × 74″; two No. 2 hangers; pulley on cylinder, 8″ × 6″; speed, 2,250 rotations per minute.

HORSE POWER to drive, 5; floor space occupied, 48″ × 72″.



No. 1 Patent Automatic Double Spoke Tenoning, Mitering, and Pointing Machine.

Export Shipping Weight, 4,000 Pounds.
Net Weight, 3,200 Pounds.
Cubic Measurement, 155 Feet.
Cable Word, TRUE.

No. 1 Patent Automatic Double Spoke Tenoning, Mitering, and Pointing Machine.

Export Shipping Weight, 4,000 Pounds.
Net Weight, 3,200 Pounds.
Cubic Measurement, 155 Feet.
Cable Word, TRUE.

THIS ENGRAVING represents our No. 1 Automatic Double Spoke Tenoning, Mitering and Pointing Machine, which has been designed for the use of spoke, wheel and wagon manufacturers to dress the ends of spokes to fit the mortise in the hub. It is extremely simple in its operation and well calculated to cover every requirement in this line. It will handle either small or large spokes, cut plain tenons, or tenon, miter and point a Sarven spoke at one pass through the machine. All the parts of this machine are so strong and well made that absolutely true and uniform work can be expected of it at the rate of 15,000 spokes per day.

THE COLUMN is heavy and mounted upon a broad base. The saddles supporting the cutter head spindles are gibbed to the column, having a vertical adjustment by hand-wheel to regulate the thickness of tenon. Both heads can be adjusted vertically together for regulating the position of the tenon with the spoke without altering the adjustment for thickness of tenon. These several adjustments can be made while the machine is in motion.

THE FEEDING REELS are driven by cut gearing and a friction clutch connected by a foot pedal which enables the operator to stop or start the feed instantly from the working side of the machine. The movement of the reels, being smooth and positive, insures a steady motion and a true cut.

AN INGENIOUS EQUALIZING DEVICE is employed, which receives and presents the spokes to the cutters so that the tenons are always formed exactly in the center of the spoke, regardless of inequalities of thickness or irregularities in turning.

THE EXPANDING CUTTER HEADS of novel construction are mounted upon heavy steel spindles. They are 9″ in diameter and so arranged that by turning a single key the beveling knives can be adjusted instantly for bevels of different thicknesses. They are equipped with shear cutting knives and saws to form the shoulder of the tenon. Oak or second-growth hickory spokes can be tenoned smooth and to the proper size without tearing. A shield surrounds the upper head, preventing any possible chance for the operator to become injured.

THE SPOKES to be operated upon are simply placed upon the reels at a slight angle to secure the proper dish when driven into the hub and automatically presented to the action of the cutters, and discharged automatically into a rack in the rear portion of the machine when they are completed.

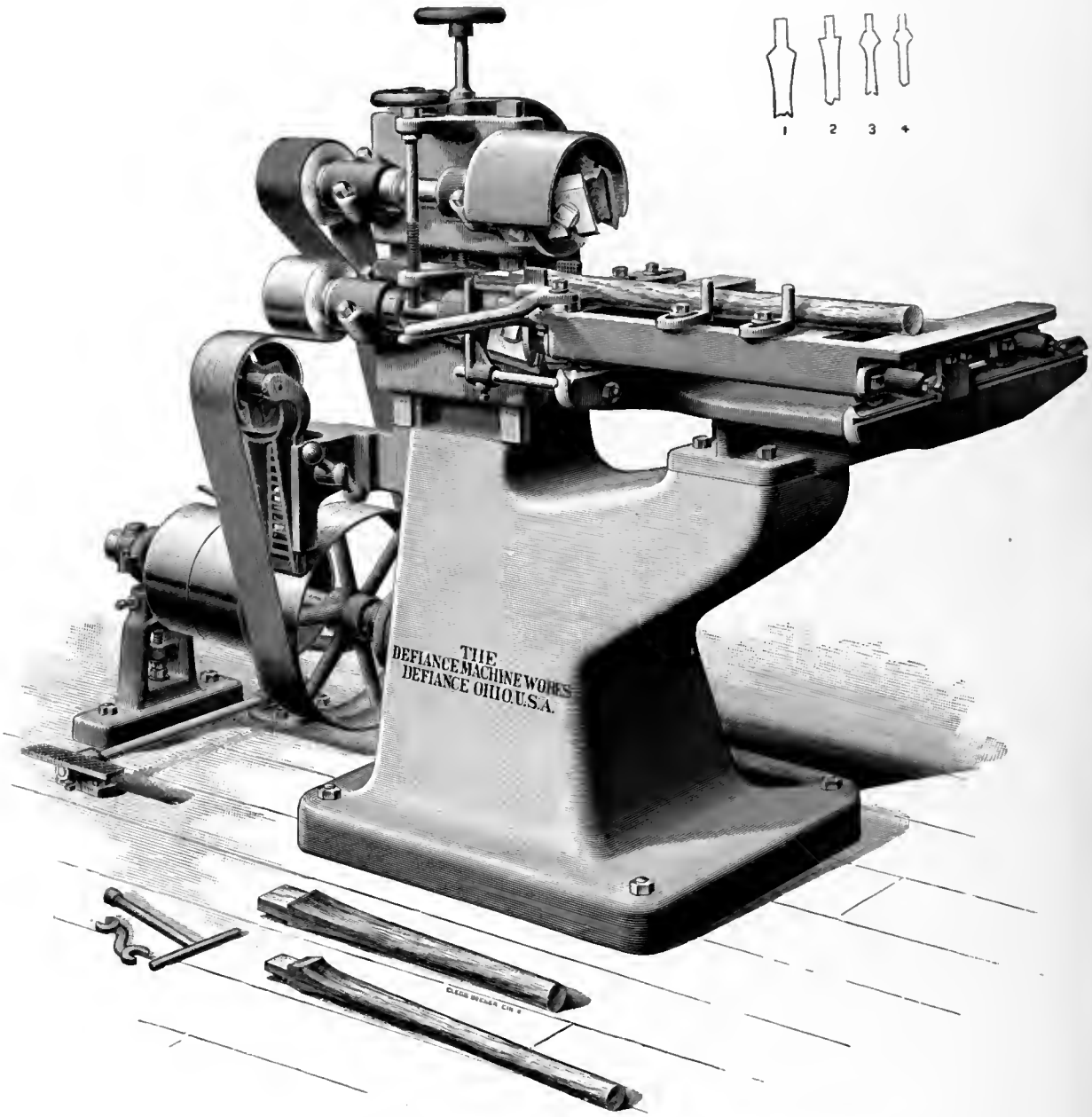
THE BELT which drives the cutter heads is at the end of the machine, and when once in position requires no attention, as a binder pulley supplies the proper tension.

THIS MACHINE is capable of making any shape of tenon desired on Common, Sarven, Warner or Sharp-edged spokes at the rate of 15,000 spokes per day, with an inexpensive operator to handle it.

THE COUNTER is furnished as follows:

Two No. 2 Ball-and-Socket Adjustable Hangers. Shaft, $1\frac{11}{16}'' \times 54''$. Driving Pulley, $24'' \times 3\frac{1}{2}''$. Driving Pulleys for feed, $4\frac{3}{8}'' \times 2''$ and $3'' \times 2''$. Tight and Loose Pulleys, $10'' \times 5''$. Speed, 650 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, $55'' \times 60''$.



No. 2 Heavy Double Spoke Tenoning Machine.

Export Shipping Weight, 2,100 Pounds.

Net Weight, 1,600 Pounds.

Cubic Measurement, 84 Feet.

Cable Word, TRANSVOY.

No. 2 Heavy Double Spoke Tenoning Machine.

Export Shipping Weight, 2,100 Pounds.
Net Weight, 1,600 Pounds.
Cubic Measurement, 84 Feet.
Cable Word, TRANSVOY.

THIS MACHINE is well and favorably known by all spoke and wheel makers as the most perfect and conveniently arranged machine for cutting tenons on wagon and carriage spokes.

IT IS adapted to all sizes and classes of work in this line. It cuts both sides of the tenon complete at one operation; either plain tenons, tenoning and mitering, or tenoning, mitering and pointing can be accomplished at one cut, forming the tenons of equal sizes and cutting the shoulders square and clean.

THE ENTIRE WORKING PARTS are mounted upon a heavy substantial metal frame, cast in one piece, with a broad floor base. All the revolving parts are perfectly balanced and supplied with heavy bearings, insuring perfect absence of vibration.

THE CARRIAGE is fitted with wheels and it is gibbed to and travels upon V-shaped ways substantially supported at each end; it runs exceedingly light and easy, and cannot rise from its ways or chatter, thus overcoming a serious objection found in machines provided with common slide ways. The entire carriage can be moved back from the cutter heads a sufficient amount to enable the heads to be placed on or taken off the spindles without altering any of the adjustments.

A DESIRABLE FEATURE is the method employed for adjusting the heads centrally with the spoke and to and from each other for thickness of tenon, all of which can be accomplished while the machine is in motion. The spindle boxes are gibbed to the upright, and are connected together with a suitable screw for adjusting the cutter heads for thickness of tenon. Both heads can be adjusted vertically for regulating the position of the tenon with the spoke by turning the upper hand-wheel without altering the adjustments for thickness.

THE CUTTER HEADS are supplied with shear cutting knives and saws to form the shoulder of tenon. Oak and second growth hickory spokes can be tenoned smooth to proper size without tearing. A shield surrounds the upper head, preventing any possible chance for the operator to become injured, and discharging shavings at the back portion of the machine.

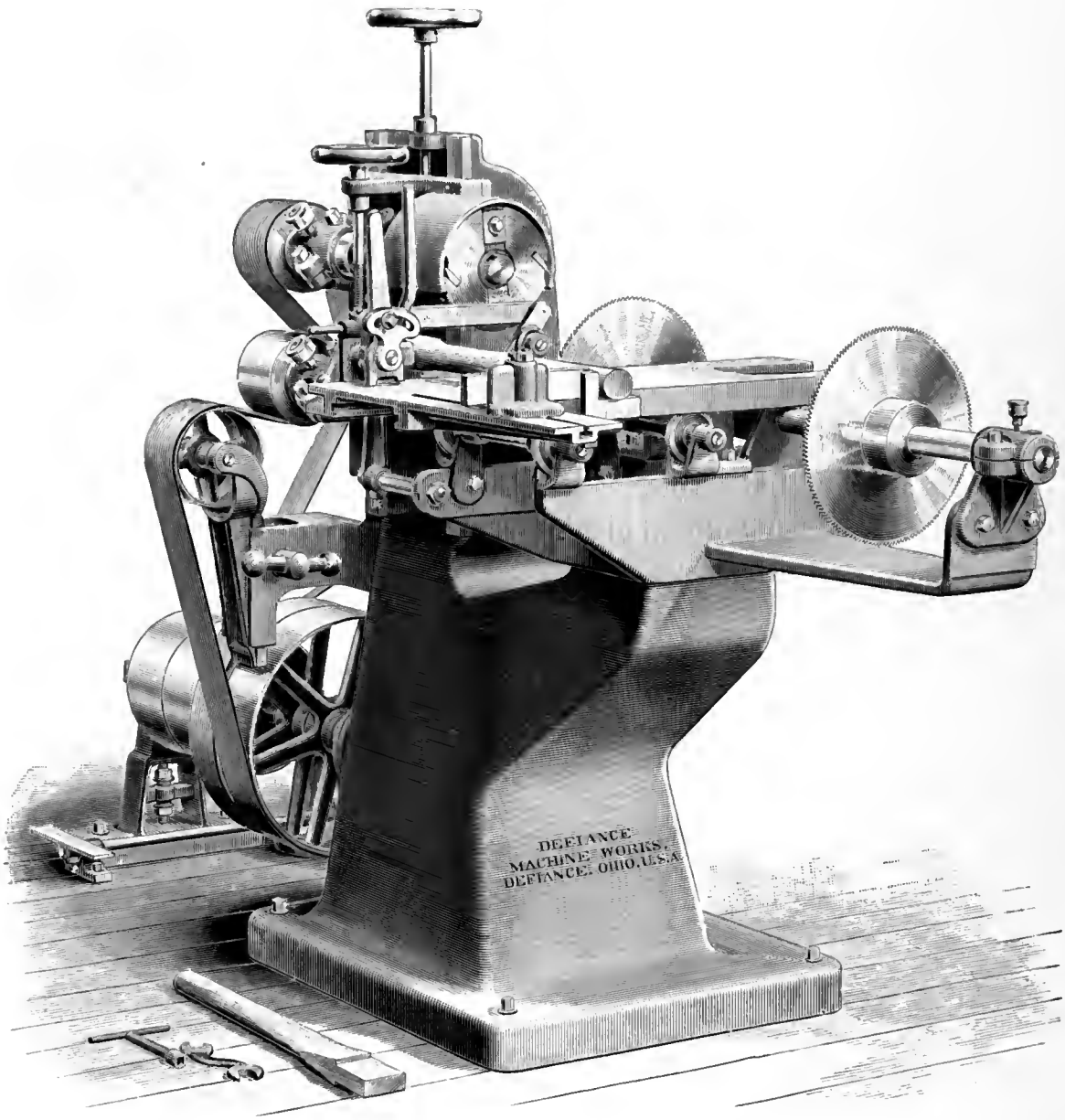
THE ARBORS are 1⅛″ diameter, of hammered steel, fitted into genuine babbitt metal, self-lubricating bearings, and they project beyond the bearings at cutter head end 7″ to accommodate the cutting of extra long tenons.

THE BELT which drives the cutter heads is at the end of the machine, and when once in position requires no attention; a binder pulley adjusts the belt.

THE MACHINE is supplied with an adjustable gauge to set the spoke for length of tenon and stops and clamps for setting and holding the spoke while being tenoned.

THE COUNTERSHAFT is 1⅛″ diameter and is fitted with tight and loose pulleys 10″ × 5″, which should run 1,200 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, 33″×55″.



No. 3 Heavy Double Spoke Tenoning and Equalizing Machine.

Export Shipping Weight, 2,200 Pounds.

Net Weight, 1,550 Pounds.

Cubic Measurement, 99 Feet.

Cable Word, TANITE.

No. 3 Heavy Double Spoke Tenoning and Equalizing Machine.

Export Shipping Weight, 2,200 Pounds.
Net Weight, 1,550 Pounds.
Cubic Measurement, 99 Feet.
Cable Word, TANITE.

THIS ENGRAVING represents our No. 3 Heavy Double Spoke Tenoning and Equalizing Machine, especially intended for the use of spoke makers for cutting the tenon on the end of spokes to fit the mortise in the wheel's hub and perform the equalizing at the same time.

IT IS so strong and perfectly built that correct work can be expected from it, and it is provided with all the necessary adjustments to accommodate from the lightest to the very heaviest work. It cuts both sides of the tenon complete at one pass through the machine. Either plain tenons, or tenoning, mitering and pointing of the spoke can be accomplished at one cut, reducing the tenon to exact size with beveled or square shoulders.

THE WORKING PARTS are mounted upon a heavy iron frame cast in one piece, with cored center, with a broad floor base. All the rotating parts are perfectly balanced, which insures a smooth running machine.

THE TABLE which supports the spoke travels upon rollers at both sides of the table. It runs exceedingly light and easy and it is thoroughly gibbed to the rollers to prevent chattering. This improvement overcomes serious objections found in machines fitted with common slide ways. The table can be moved back from the cutter heads a sufficient amount to enable the heads to be placed on or taken off the spindles without changing any of the adjustments of the machine.

AN INGENIOUS METHOD is employed for centering and holding the spoke true with the cutter heads without any care on the part of the operator. It will hold spokes of different sizes and lengths without any adjustments.

THE SADDLES supporting the cutter head spindles are gibbed to the upright and connected by heavy hand-screws for adjusting the cutter heads vertically. One screw is used to adjust for the thickness of tenon, and the other for regulating the position of the tenon with the spoke. These several adjustments can be made while the machine is in motion.

THE CUTTER HEAD SPINDLES, of steel, $1\frac{1}{16}''$ diameter, run in long, substantial bearings. At the cutter head end they extend 7 inches beyond the bearing and accommodate extra wide heads for long tenons.

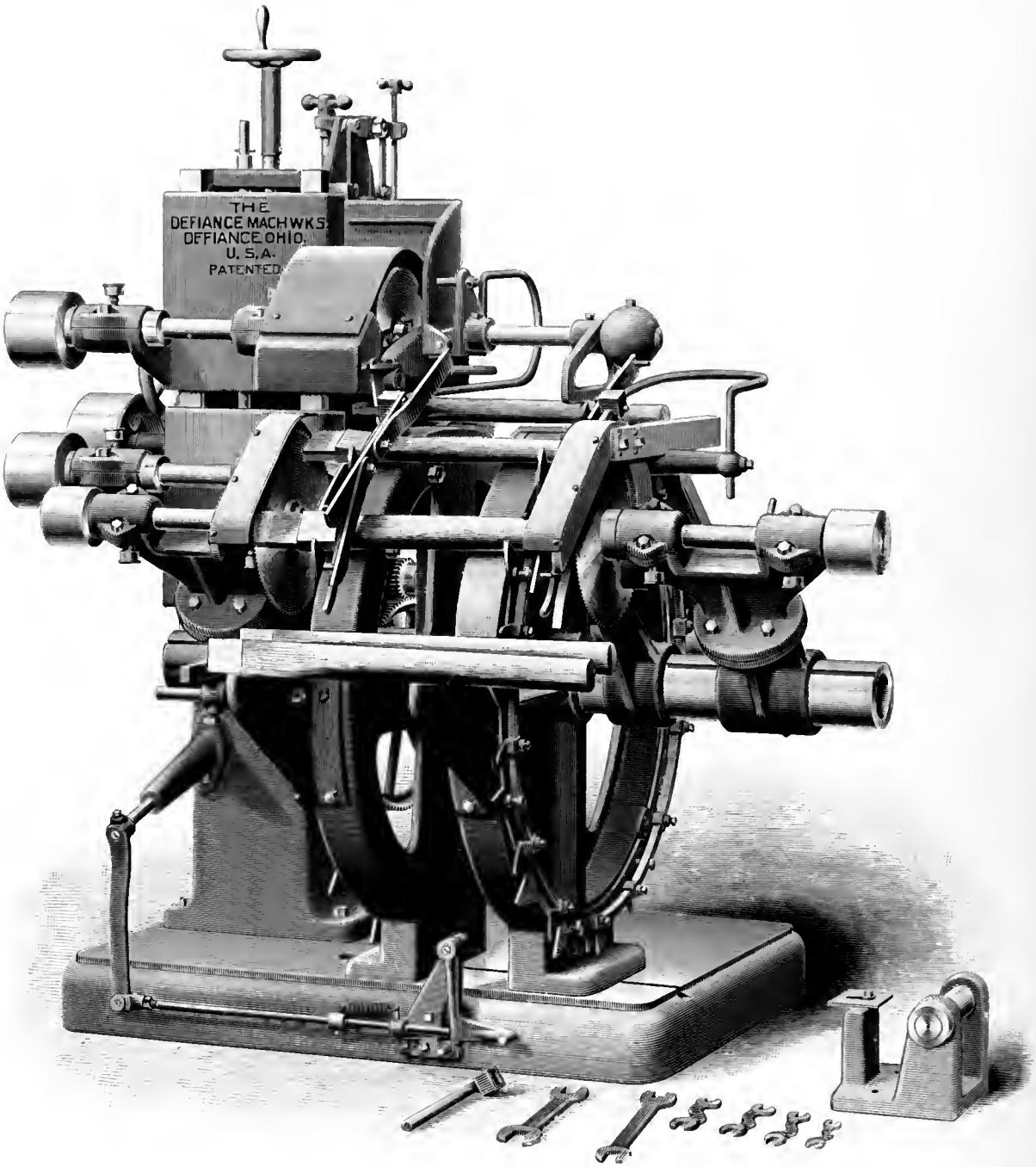
THE CUTTER HEADS are equipped with shear cutting knives capable of cutting the hardest wood smooth and true without tearing. A shield surrounds the upper head, preventing any possible chance for the operator to become injured, and discharging the shavings at the rear of the machine.

THE EQUALIZING SAWS are fitted to large collars which are adjustable upon a steel shaft by loosening a single screw for regulating the length of cut. They are located immediately behind the cutter heads so that the spoke passes from one to the other and is discharged at the rear of the machine finished. The saws can be quickly removed if not required for some classes of work.

THE BELT which drives the cutter heads is at the rear of the machine out of the way, and when once in position requires no attention; a binder pulley adjusts the belt.

THE COUNTERSHAFT is a portion of the machine. It is $1\frac{1}{16}''$ in diameter and fitted with tight and loose pulleys $10'' \times 5''$, which should run 1,200 turns per minute. The belt is moved from one pulley to the other by a convenient foot treadle for starting and stopping the machine.

HORSE POWER to drive, 1; floor space occupied, $33'' \times 63''$.



No. 4 Patent Automatic Double Spoke Tenoning and Equalizing Machine.

Export Shipping Weight, 4,800 Pounds.

Net Weight, 3,800 Pounds.

Cubic Measurement, 189 Feet.

Cable Word, TANGIER.

No. 4 Patent Automatic Double Spoke Tenoning and Equalizing Machine.

Export Shipping Weight, 4,800 Pounds.

Net Weight, 3,800 Pounds.

Cubic Measurement, 189 Feet.

Cable Word, TANGIER.

THIS ENGRAVING represents our new No. 4 Patent Automatic Double Spoke Tenoning and Equalizing Machine, which has been designed for the use of spoke, wheel and wagon manufacturers for cutting off both ends of the spoke and cutting the tenon for the mortise in the wheel's hub at one operation. It will successfully handle either small or large spokes and do the work with great accuracy with an inexpensive operator to handle it.

IT WILL CUT plain tenons such as used on wagon and plain carriage wheels, and tenon, miter and point Sarven spokes at the rate of from 12,000 to 15,000 spokes in ten hours, depending upon the size of the work. It improves the quality of the product and greatly decreases the cost over any other method.

THE COLUMN supporting the working parts is heavy and is mounted upon a broad and substantial base, with cored center, making it strong and rigid to overcome vibration, so as to insure accurate tenoning on the heaviest and hardest spokes. The saddles supporting the cutter head spindles are gibbed to the column, having a vertical adjustment by hand wheel to regulate the thickness of the tenon. Both heads can be adjusted vertically together for regulating the position of the tenon with the spoke without altering the adjustment for thickness of tenon. These several adjustments can be made while the machine is running. An equalizing device is employed which receives and presents the spokes to the cutters, so that the tenons are always formed exactly in the center of the spoke regardless of inequalities of thickness or irregularities in turning.

THE FEEDING REELS are rotated by cut gears and a friction clutch connected by a convenient foot treadle, enabling the operator to start or stop the feed instantly while the balance of the machine is in motion.

THE EXPANDING CUTTER HEADS are mounted upon heavy steel spindles running in long self-oiling bearings. The beveling knives can be adjusted by turning a single key to cut bevels of different thicknesses. They are equipped with shear cutting knives and spur saws to cut oak, hickory, and other hard woods smooth and true without lifting or tearing the fiber. A safety shield surrounds the heads and saws to protect the operator from harm.

THE CUT-OFF SAWS are fitted to heavy steel spindles; and they can be quickly adjusted for spokes of different length, or they can be swung out of the way if their service is not required.

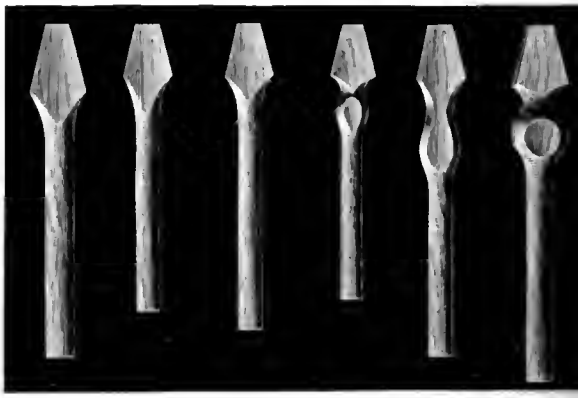
THE SPOKES to be equalized and tenoned are simply placed upon the feeding reels and automatically presented to the action of the saws and cutter heads, and discharged at the rear of the machine into a rack.

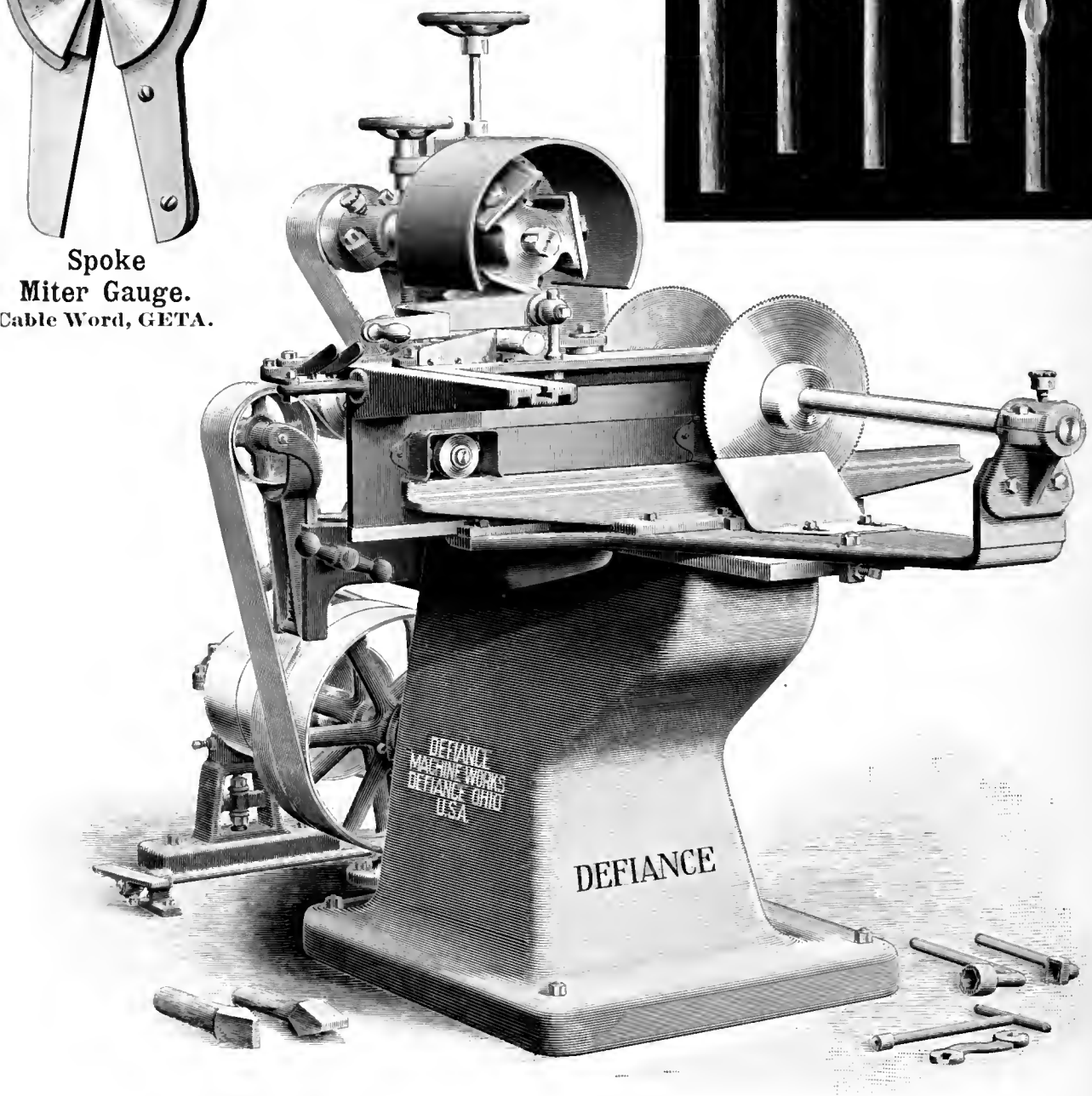
THIS MACHINE is capable of making any size or shape of tenon as desired on common, Sarven or sharp-edged spokes down to as short as 14″, and up to the longest spoke used, and when adjusted for a certain size and kind of spoke, it will reproduce them in exact duplicates, so they will correctly fit the mortise in the wheel's hub.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}'' \times 93''$ long; three No. 2 adjustable drop hangers; tight and loose pulleys, $12'' \times 6''$; one driver, $24'' \times 4''$; one driver, $18'' \times 6''$; one driver, $18'' \times 12''$; one three step cone, 3″, 4″, and 5″ diameter, 2″ face; speed of tight and loose pulleys, 650 revolutions per minute.

HORSE POWER required to drive, 3; floor space occupied, $55'' \times 60''$.

Spoke Miter Gauge.
Cable Word, GETA.





No. 5 Automobile Spoke Mitering and Equalizing Machine.

Export Shipping Weight, 2,150 Pounds.
Net Weight, 1,650 Pounds.
Cubic Measurement, 99 Feet.
Cable Word, MOLTIND.

No. 5 Automobile Spoke Mitering and Equalizing Machine.

Export Shipping Weight, 2,150 Pounds.
Net Weight, 1,650 Pounds.
Cubic Measurement, 99 Feet.
Cable Word, MOLTIND.

THIS ENGRAVING represents our No. 5 Automobile Spoke Mitering and Equalizing Machine, especially designed for the use of automobile and artillery wheel builders for accurately cutting both miters on the hub end of spokes and equalizing them to exact length at one pass through the machine, reducing the miters to the proper size and length, making an accurate fit when pressed together in the wheel's hub, making all the arches at the throat agree perfectly when the wheel is completed. It is an exceptionally strong and powerful machine capable of doing from the very lightest to the very heaviest work. It cuts a smooth, clean miter avoiding hand labor entirely.

THE WORKING PARTS are mounted upon a heavy iron frame in one piece with a broad floor base to stand firm to overcome vibration and secure a smooth and uniform cut.

THE TABLE, of entirely new construction, is mounted at either end upon two non-friction wheels, which travel upon a single track. It is supported sidewise by a guide rail underneath, all the weight of the table resting upon the wheels, consequently it runs light and easy although free from vibration when doing the heaviest class of work. The spoke is held true with the cutter heads between self-centering jaws, requiring no care on the part of the operator in placing the work into the machine. The entire table with the saws can be quickly moved horizontally back from the cutter heads a sufficient distance to enable the heads to be placed on or off the spindles without altering any of the adjustments of the machine, saving time and trouble when changes of heads and knives are necessary.

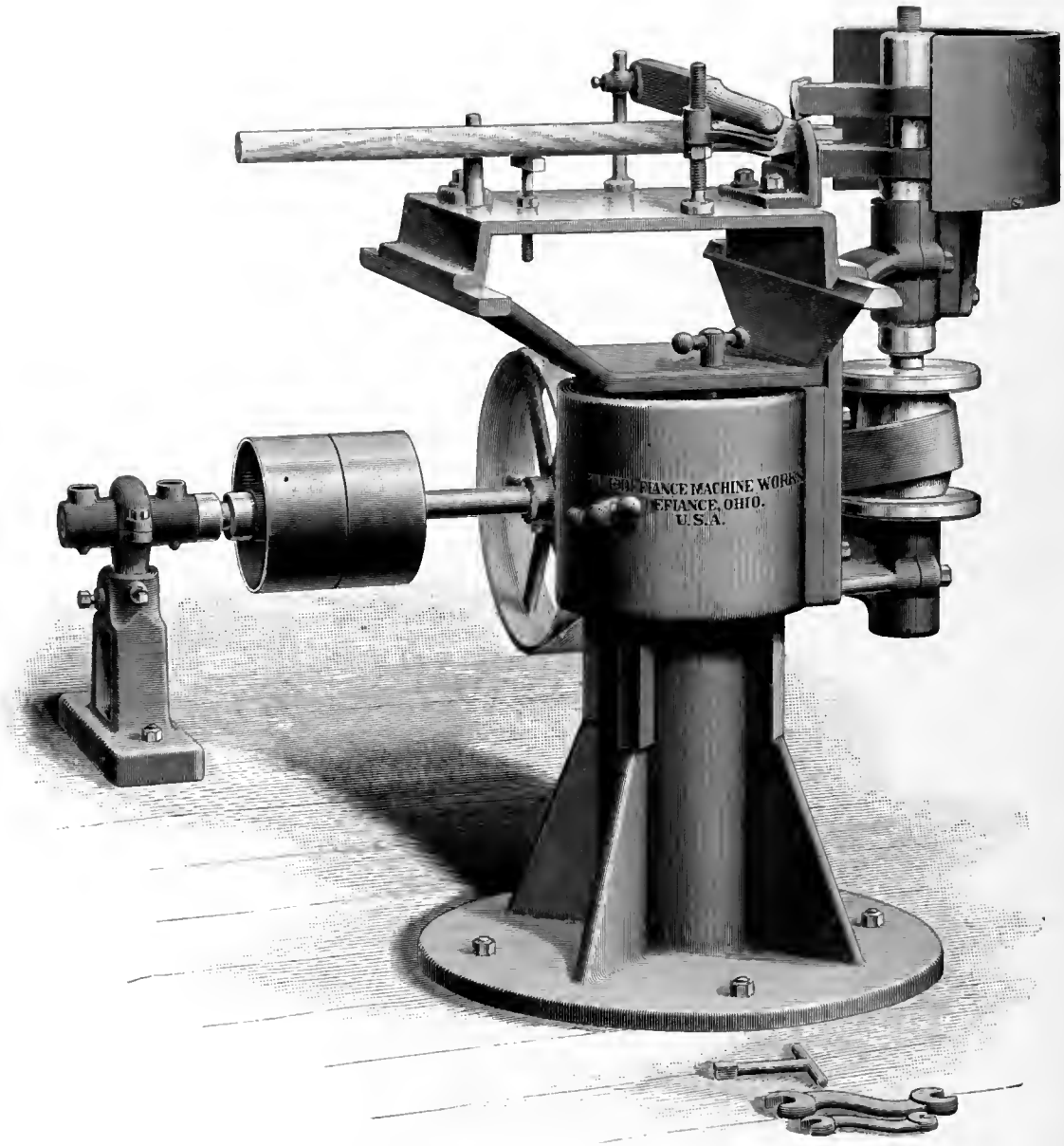
THE SAWS are fitted to large collars which are adjustable upon a steel spindle by loosening a single screw for regulating the length of spoke.

THE SADDLES supporting the cutter head spindles are gibbed to the upright and connected by heavy hand screws to adjust the cutter heads vertically; one screw adjusts them for thickness of miter and the other for regulating the position of the miter with the spoke.

THE CUTTER HEADS are supported upon heavy ground steel spindles running in long self-lubricating bearings. Each head is equipped with three shear cutting knives, which are capable of cutting the hardest wood smooth without lifting the grain. A shield surrounds the upper head to protect the operator and discharge the shavings to the rear of the machine.

THE COUNTER is a part of the machine; Shaft, $1^{11}/_{16}'' \times 44''$; driving pulley for cutter heads, $16'' \times 4''$; driving pulley for equalizing saws, $16'' \times 3''$; tight and loose pulleys, $12'' \times 6''$; speed, 1,000 turns per minute; they can be belted to from above, below or either side.

HORSE POWER to drive, 2; floor space occupied, $66'' \times 40''$.



No. 1 Improved Spoke Sizing or Re-Tenoning Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 25 Feet.

Cable Word, SOVEREIGN.

No. 1 Improved Spoke Sizing or Re-Tenoning Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 600 Pounds.
Cubic Measurement, 25 Feet.
Cable Word, SOVEREIGN.

THIS ENGRAVING represents our No. 1 Improved Spoke Sizing or Re-Tenoning Machine, which has been designed for sizing or re-tenoning the hub end of spokes, reducing the tenons to a uniform thickness to fit the mortise in the hub perfectly. This method insures truer and more perfect work than can be accomplished with a regular tenoning machine. It is necessary, especially on heavy spokes used for wagon, truck, or artillery wheels, to re-tenon them just before they are driven into the hub, to secure a neat fit. By this machine, the work is accomplished so quickly that the expense is trifling, and absolutely correct work can be secured.

THE FRAME of this machine is cylindrical in form. It is cast in one piece with cored center and a wide flange base so the operator can stand close up to his work. The sliding carriage is mounted on top of the frame in planed and scraped guide ways and it slides to and from the cutter heads with the greatest ease. The device for holding the spoke is self-centering, requiring no care on the part of the operator to correctly place the work into the machine.

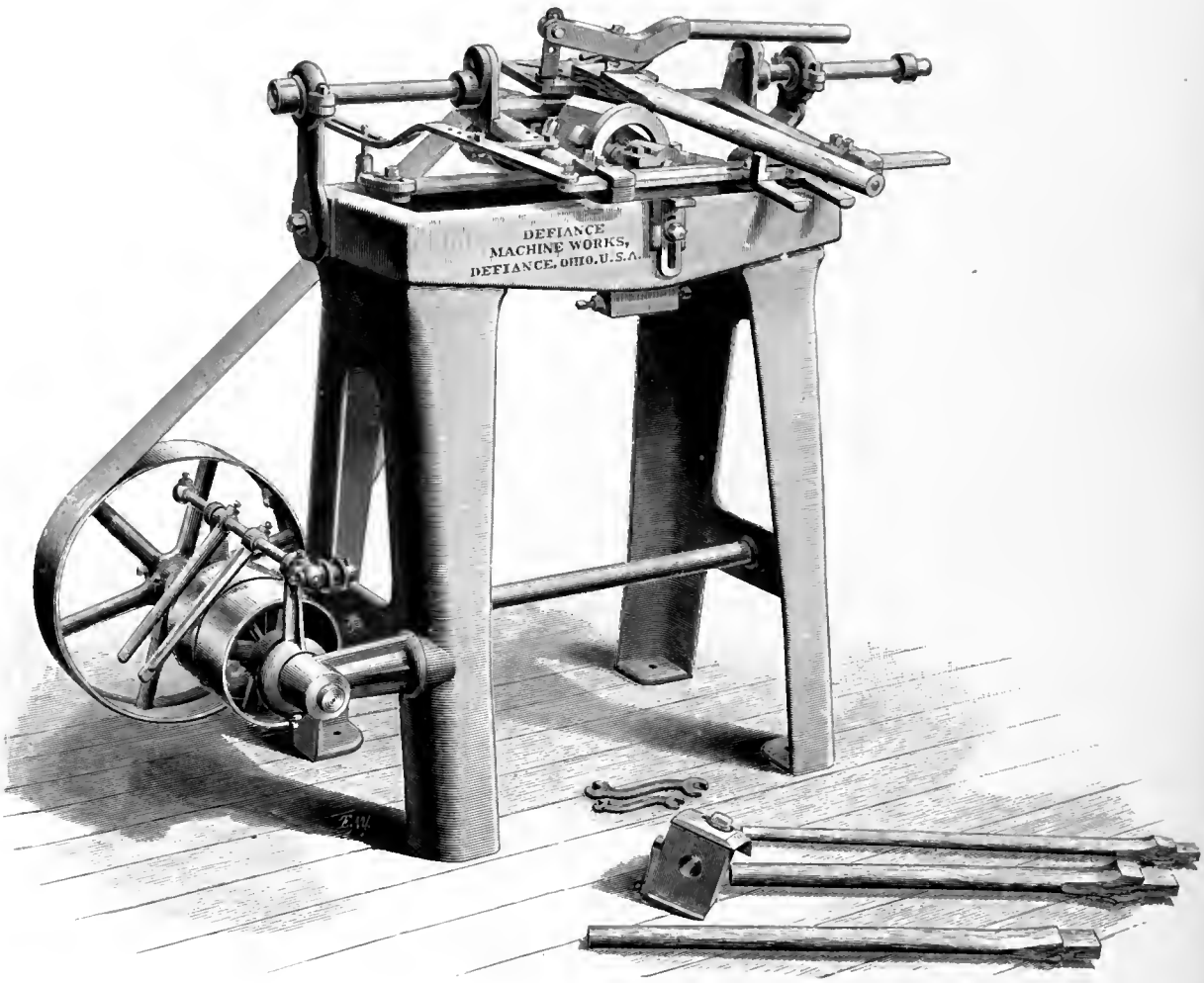
THE CUTTER HEAD SPINDLE, of steel, stands at right angles with the table, and it runs in heavy self-lubricating genuine babbitt metal boxes, attached to a large circular sleeve, surrounding the main column of the machine, and it is provided with a vertical adjustment by hand screw to set the cutter heads true with the barrel of the spoke.

THE CUTTER HEADS have a screw adjustment on the spindle so that they can be set to a nicety for tenons of different sizes. The knives used have shear cutting edges and they cut perfectly smooth and true.

THE SPOKE to be re-tenoned is placed upon the self-centering guides on the table and held in position by a convenient and quick-acting hand clamp. A single pass of the spoke through the machine completes both sides of the tenon.

THE COUNTER is furnished as follows: two No. 1 ball and socket adjustable floor stands with our improved belt shipping apparatus attached; one shaft, $1\frac{7}{16}$″×36″; one driving pulley, 16″×3″; tight and loose pulleys, 8″×4″; speed, 600 turns per minute.

HORSE POWER to drive, ½; floor space occupied, 21″×28″.



No. 0 Improved Spoke Throating Machine.

Export Shipping Weight, 800 Pounds.

Net Weight, 450 Pounds.

Cubic Measurement, 38 Feet.

Cable Word, TOLEDO.

No. 0 Improved Spoke Throating Machine.

Export Shipping Weight, 800 Pounds.

Net Weight, 450 Pounds.

Cubic Measurement, 38 Feet.

Cable Word, TOLEDO.

OVER EIGHT HUNDRED of our improved spoke throating machines, as shown by the engraving, are in successful operation, and wherever used the machine becomes a general favorite.

IT WILL finish the throat at one cut, smooth, without tearing, and is quickly changed from one size and shape of spoke to another. It is adapted to Common, Sarven, and Warner patent or Sharp-edged spoke throating, with convenient adjustments to work spokes from ¾″ to 5″, any length.

THIS MACHINE is very substantial, and simple in its operation, can be handled successfully by inexpensive labor, performing every class of spoke throating known to the trade, and is suited to a wide range of work, accomplishing it more perfectly than by any other method.

THE FRAME, of neat design, is cast cored style and well braced.

THE CUTTER HEAD is fitted to a heavy steel spindle running in genuine babbitt metal bearings, provided with knives with shear or draw cutting edges.

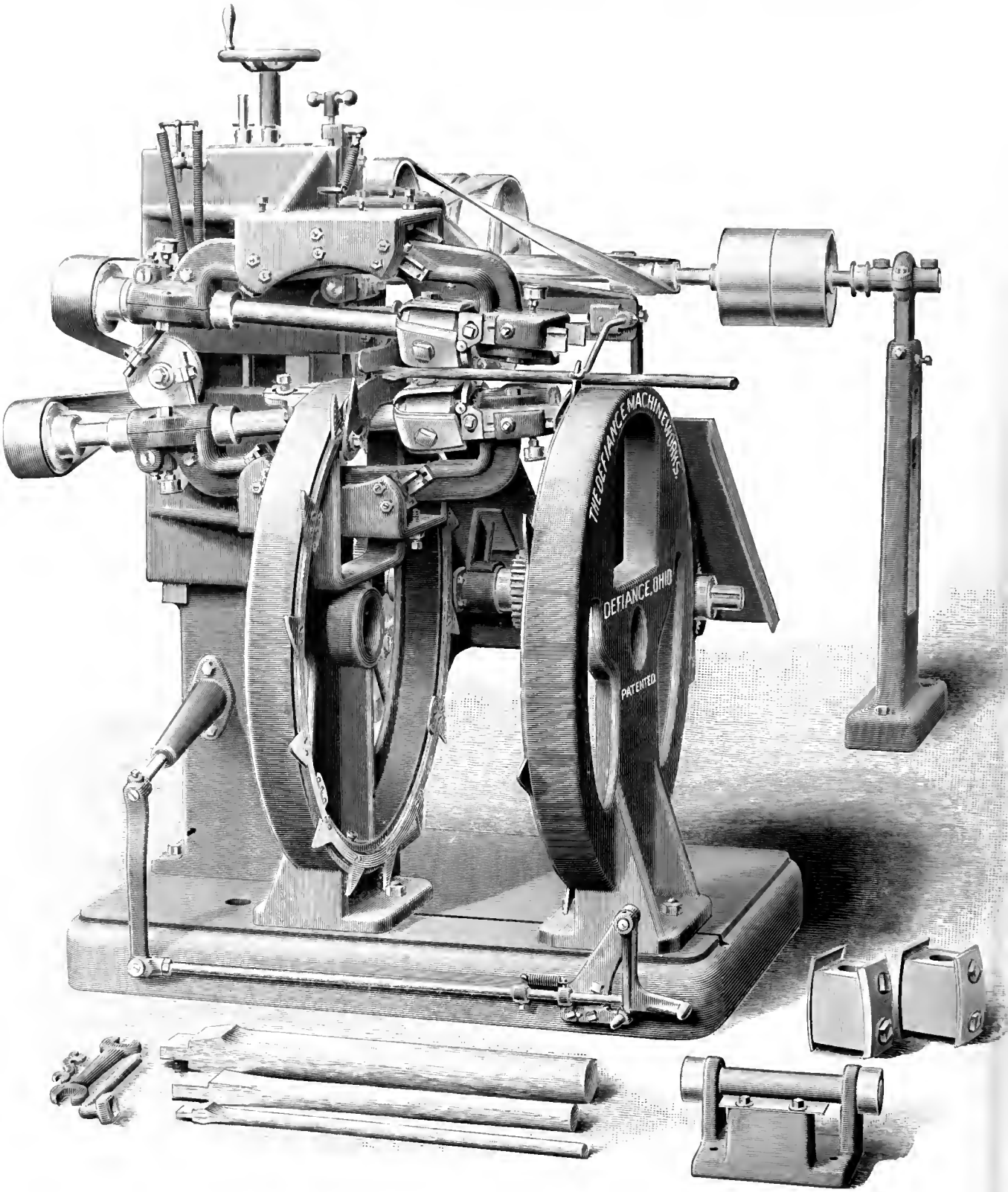
A CAM OR SHOE, over which the outer end of spoke travels, is fastened to the inside of frame, close to the outer end of the cutter head, having vertical adjustment to regulate the depth of cut.

THE CARRIAGE, upon which the spoke is held, slides over the cutter head in ball and socket bearings located at either end of the frame. The outer side of carriage is arranged to travel faster than the inner side to carry the spoke over the cutter head in a circular path which regulates the shape of throat nearest tenon end. The amount of throw can be increased or diminished to suit the requirement by adjusting the collars attached to the sliding spindles.

THE SPOKE is placed upon the carriage with the tenon end securely clamped to the table, the outer end held in a gauge by the weight of the operator's hand. As the spoke is fed toward the cutter head, it rides over the cam, the table oscillating according to the shape of spoke, and the throat is formed corresponding with the shape and size of any spoke put into the machine, a single cam performing any style of throating.

THE COUNTER is a portion of the machine and is supplied with belt shipping apparatus, and is ready to run when received. Tight and loose pulleys are 7″ × 3½″; speed, 1,000 rotations per minute.

HORSE POWER to drive, ½; floor space occupied, 24″ × 48″.



No. 1 Patent Automatic Double Spoke Throating Machine.

Export Shipping Weight, 4,400 Pounds.
Net Weight, 3,600 Pounds.
Cubic Measurement, 138 Feet.
Cable Word, TENEYCK.

No. 1 Patent Automatic Double Spoke Throating Machine.

Export Shipping Weight, 4,400 Pounds.
Net Weight, 3,600 Pounds.
Cubic Measurement, 138 Feet.
Cable Word, TENEYCK.

THIS ENGRAVING represents our No. 1 Patent Automatic Double Spoke Throating Machine which is used by spoke, wheel and wagon manufacturers to rapidly and accurately throat both sides of spokes at one pass through the machine. It is calculated to handle either small or large spokes in common, Sarven, Warner, and sharp-edged patterns at the rate of 12,000 per day, doing the work smoothly, and securing any shape of throat desired.

THE COLUMN is massive and mounted upon a broad, heavy base. The saddles supporting the cutter head spindles are gibbed to the column and provided with a vertical adjustment by hand wheel to regulate the thickness and position of throat and size of spokes. Both cutter heads can be adjusted together to regulate the position of the throat with the tenon, without altering the adjustment for thickness of throat.

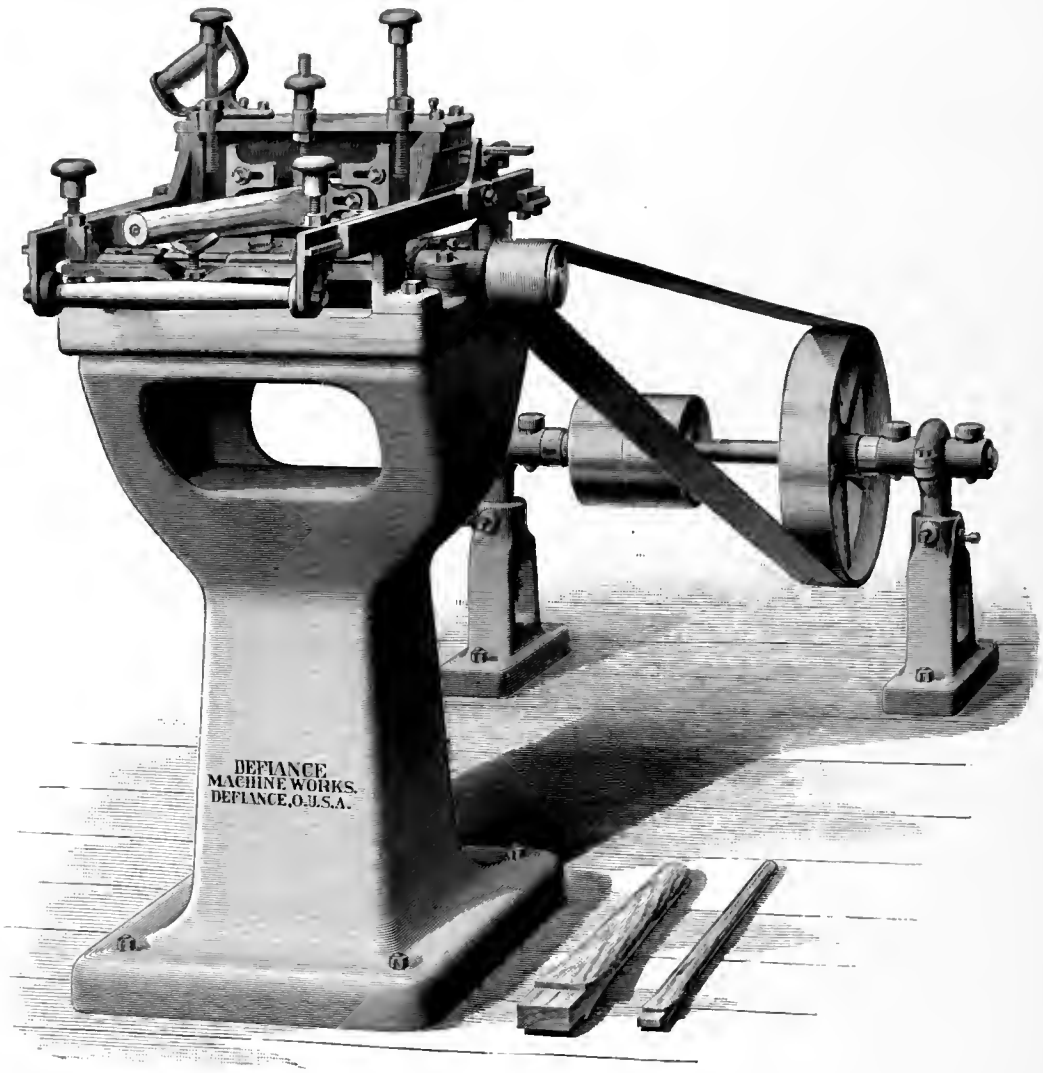
THE CUTTER HEAD SPINDLES are supported in substantial frames, which are attached to the saddles in ball bearings for securing the oscillating movements to the heads. An ingenious equalizing device is fitted to the spindle boxes to secure a uniform oscillating movement.

THE FEEDING REELS are driven by cut gearing and a friction clutch connected by a convenient foot pedal for instantly starting or stopping the feed. The outside reel turns faster than the one on the inside to carry the spokes to the cutter heads in a circular path for throating thinner on the face than back of spokes, similar to that important feature secured heretofore by the hand-feed throater. A cam shoe is fitted to each cutter head box near the heads, and as the spokes are fed to the heads the cam shoes travel over the barrel of the spokes and oscillate the cutters in a path to correspond with the shape and size of spoke fed into the machine.

THE SPOKES to be operated upon are simply placed upon the feeding reels, which automatically present them to the cutters, when both sides are treated at one time and the finished spokes are discharged into a rack at the rear of the machine.

A COUNTER is furnished as follows: Shaft, $1^{11}/_{16}'' \times 60''$; two floor stands, 44″ high; tight and loose pulleys, $10'' \times 5''$; speed, 1,000 revolutions per minute; one three-step cone pulley for feed.

HORSE POWER to drive, 1½; floor space occupied, $53'' \times 59''$.



No. 0 Patent Spoke Facing and Tapering Machine.

Export Shipping Weight, 800 Pounds.

Net Weight, 500 Pounds.

Cubic Measurement, 32 Feet.

Cable Word, FROLIC.

No. 0 Patent Spoke Facing and Tapering Machine.

Export Shipping Weight, 800 Pounds.
Net Weight, 500 Pounds.
Cubic Measurement, 32 Feet.
Cable Word, FROLIC.

THIS ENGRAVING represents our No. 0 Patent Spoke Facing and Tapering Machine, which is used for facing and tapering the edges of spokes after the turning, tenoning, and throating have been performed, and reduce the tenon end to the desired width and taper, finishing the edges of the spoke true and smooth with sharp, clean corners of the proper size to fit the mortise in the hub.

IT IS an excellent machine and is giving the highest satisfaction to the large number of spoke, wheel, and wagon manufacturers using them. All of its parts are simple and the adjustments quickly made to work small or large spokes, having a capacity of finishing 4,000 spokes in ten hours.

THE SPOKE is planed lengthwise with the grain, square with the tenon, working cross-grained material without destroying the corners or edges. In this respect a large saving is effected over the Dise or Wheel Spoke Facing Machine that performs the cutting directly across the grain, which frequently tears off the corners, cuts the work uneven and not true to width. The facing being the last operation on the spoke necessarily should be accurately performed or the value of the spoke would be entirely destroyed.

THE WORKING PARTS are mounted upon a substantial iron frame cast in one piece with cored center, having a broad floor base to stand firm, and the rotary parts are accurately balanced, insuring perfect absence of vibration.

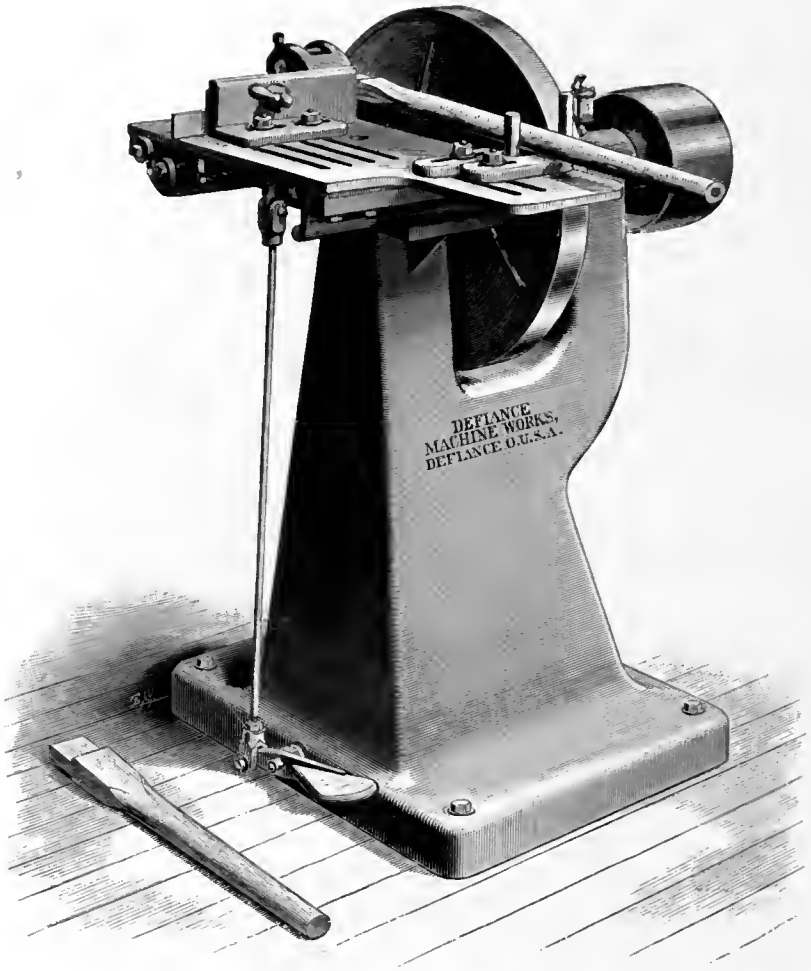
THE CUTTER HEAD is forged from solid steel, including its journals, which run in genuine babbitt metal boxes in the top of the frame, and it is supplied with three cutters.

THE CARRIAGE into which the spoke is placed while being operated upon is elevated above the cutter head and it slides in planed angle ways at right angles over the cutters. The spoke is clamped at the tenon end between steel jaws located at the rear of the carriage. The jaws open and close automatically to receive and remove the spoke, holding the spoke perfectly square by the tenon sides. The other end of the spoke is supported in a gauge having a vertical attachment to face the spoke parallel, and to cut the taper to any angle desired.

IN OPERATING THE MACHINE the carriage is moved backward, when the jaws automatically open to receive the spoke, and when pulled forward the jaws close in on the tenon and hold it firm and square while being operated upon, and at the end of the cut are automatically opened for the removal of the spoke.

THE COUNTER is furnished complete as shown, the tight and loose pulleys are 7″ diameter, 3½″ face, and should run 1,000 turns per minute. The counter can be placed to belt the machine from above or below.

HORSE POWER to drive, 1; floor space occupied, 20″×35″.



No. 1 Improved Disc Spoke Facing and Tapering Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 30 Feet.

Cable Word, FORWARD.

No. 1 Improved Disc Spoke Facing and Tapering Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 700 Pounds.
Cubic Measurement, 30 Feet.
Cable Word, FORWARD.

THIS MACHINE is designed for facing and jointing the sides of spokes after the turning, tenoning, and throating is performed to reduce the tenon end to the desired width and bevel to fit the mortise in the hub.

THE FRAME is cast in one piece with cored center, is very stiff and reliable, and occupies as small amount of space as possible consistent with sufficient floor support.

THE ARBOR OF STEEL is large in diameter, and runs in self-oiling genuine babbitt metal bearings. It carries the drive pulley at the rear end, which can be belted to from above or below. At the opposite end is fitted a disc cutter head, with three cutters placed in proper position to secure a draw cut.

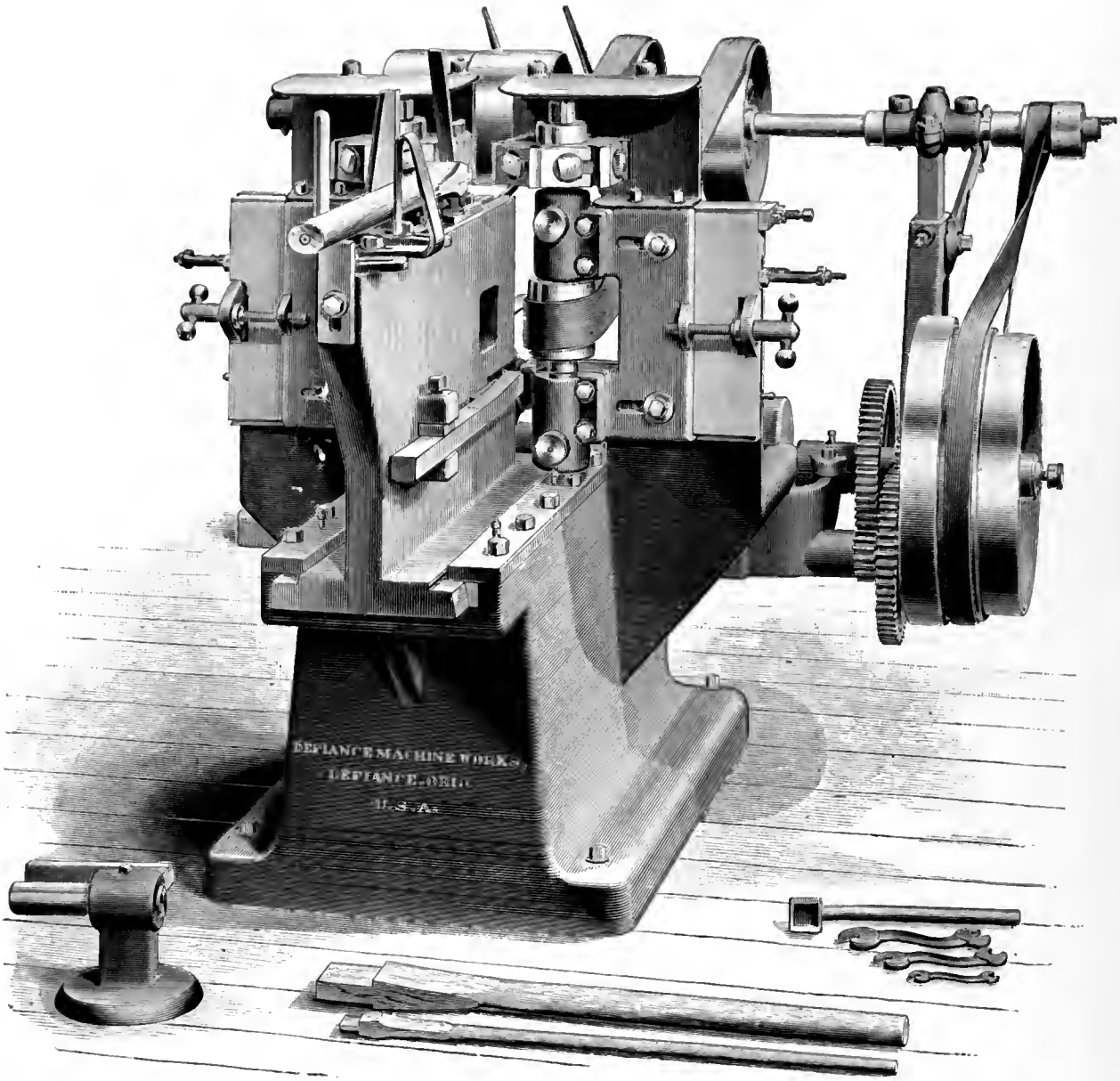
THE CUTTER HEAD is 19″ diameter, with each knife supplied with chip breakers; it is balanced by our Patent Rotary Balancing Machine, truly turned and guaranteed to run smooth, free from vibration.

THE TABLE is constructed upon a novel plan; it is planed true, light, and slides upon planed ways. It moves toward the cutter head with the greatest ease and is self-returning by a coiled spring. It is equipped with necessary stops and guides, and complete in every detail.

THE SPOKE to be operated upon is placed against a stop on the table and brought into contact with the cutter head by a horizontal movement of the table and instantly finished.

THE PULLEY ON THE ARBOR is 6″×5″, speed, 2,000 rotations per minute. A counter is furnished, when so ordered, as follows: Shaft, $1\frac{15}{16}$″×48″ long; journals turned $1\frac{7}{16}$″; two No. 1 ball and socket adjustable drop hangers; driver, 20″×5″; tight and loose pulleys, 10″×6″; speed, 800 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, 31″×40″.



No. 3 Patent Automatic Double Spoke Facing and Tapering Machine.

Export Shipping Weight, 2,500 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 72 Feet.

Cable Word, FONDULAC.

No. 3 Patent Automatic Double Spoke Facing and Tapering Machine.

Export Shipping Weight, 2,500 Pounds.

Net Weight, 2,000 Pounds.

Cubic Measurement, 72 Feet.

Cable Word, FONDULAC.

THIS ENGRAVING represents our No. 3 Patent Automatic Double Spoke Facing and Tapering Machine, used by spoke, wheel, and wagon makers, to joint or face, and taper the edges of spokes, and reduce the widths of tenons to the dimensions to fit the mortises of the wheel's hub.

THIS MACHINE has been designed to reduce the labor in preparing the spokes for the wheel; to increase the capacity, and produce the work more perfectly. Previous to its introduction they required to be handled three times; twice to complete the facing and the third operation to cut the taper or miter.

THE ENTIRE THREE OPERATIONS are now accomplished with this machine at one and the same time; cutting the tenons to exact width and the taper at any angle desired on either small or large spokes, at the rate of from 12,000 to 15,000 per day, and, if the spokes are crooked, it will dress the same and divide the difference.

THE FRAME is a heavy casting of neat design in one piece, with cored center, of sufficient strength to overcome vibration when doing the heaviest work at the greatest speed.

THE CUTTER HEADS are located on either side of the machine; standing vertical, at right angles with the spoke, they are each provided with four knives, with chip breakers, and are supported upon heavy steel spindles running in large self-oiling bearings which are attached to saddles that are gibbed to the uprights, and by a system of cams the cutter heads are automatically opened and closed. Open when the spoke is inserted, and closed when doing the work, at which position they bear against positive stops. Hand screws are provided to adjust the heads to or from each other for a small or large spoke, which adjustments can be made while the machine is running.

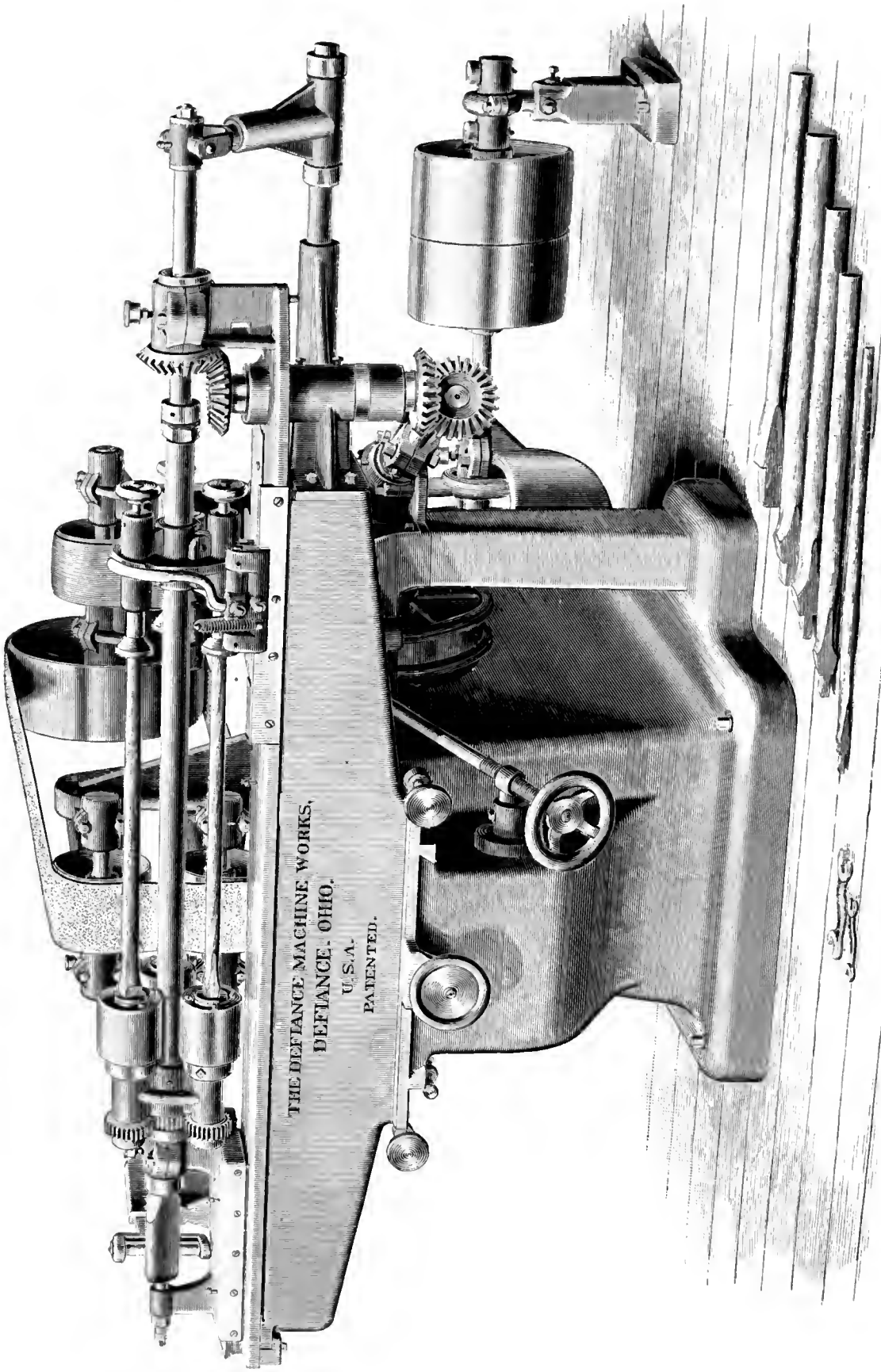
THE CARRIAGE which supports the spoke is thoroughly gibbed to the main frame, and it automatically moves in a horizontal plane between the cutter heads. An adjustable guide bar is fitted to one side of the carriage against which a roller rides, which is attached to the right hand cutter head frame which regulates the width of tenon and the amount of taper to the spoke. It can be adjusted for small or large spokes. An ingenious self-centering attachment is fitted to the top of the carriage into which the spoke is placed to hold it square with the tenon and true with the barrel, requiring no skill on the part of the operator in placing the spoke into the machine correctly.

IN OPERATING this machine the laborious work of moving a table or pushing the spoke to the cutters is entirely avoided. The spoke is simply placed on the carriage between the self-centering device, with the tenon caught with a binding effect as shown, when it is automatically presented to the action of the cutters, which planes both sides and cuts the taper complete at one and the same time. As the cutters plane the spokes with the grain of the timber, it is proof against fracturing the edges or destroying the corners of the spoke.

SO ACCURATELY does it accomplish the work that no further finishing is required, and for Sarven and other similar spokes that are used in connection with hubs provided with metal flanges used against the faces of the spokes, they do not require facing off after being driven into the hub.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 60''$ long; two ball and socket adjustable floor stands; two driving pulleys, $12'' \times 3''$; one three step cone pulley for feed, giving three changes of speed; tight and loose pulleys, $10'' \times 6''$; speed, 1,150 turns per minute.

HORSE POWER to drive, 2; floor space occupied, $44'' \times 54''$.



No. 1 Patent Automatic Spoke Throat Polishing Machine.

Export Shipping Weight, 4,100 Pounds.
Net Weight, 3,300 Pounds.
Cubic Measurement, 179 Feet.
Cable Word, PIANOLA.

No. 1 Patent Automatic Spoke Throat Polishing Machine.

Export Shipping Weight, 4,100 Pounds.
Net Weight, 3,300 Pounds.
Cubic Measurement, 179 Feet.
Cable Word, PIANOLA.

THIS ENGRAVING represents our No. 1 Patent Automatic Spoke Throat Polishing Machine, which has been designed for the use of spoke-makers and vehicle wheel builders to rapidly and accurately finish the throat or neck of either small or large spokes, and do it automatically with one unskilled operator to handle it.

FOR AUTOMOBILE SPOKES this machine is furnished to polish the throat and barrel at one operation.

ITS CAPACITY is equivalent to that of four skilled operators by the old process of holding the spoke to the polishing belt by hand, and it does a much more superior class of work, always finishing the diamond on the face of the spoke sharp and true and all alike.

THREE SPOKES are in the machine at one time, with one of them always in contact with the polishing belt, which overcomes any loss of time, and the machine is properly supplied with work without crowding the operator.

IT HAS three changes of speed, to accommodate the finishing of 5,000 large spokes, 6,000 medium and 8,000 carriage or small spokes in ten hours.

THE FRAME of this machine is of modern design, heavy and well proportioned, with a broad floor base. It is cast in one piece, with cored center, and it is of sufficient strength to properly support the working parts.

THE POLISHING BELT can be placed on or removed from the machine without disconnecting any of its parts. It is six inches wide, and of unusual length to secure a large amount of wearing surface. It travels over three pulleys, a driving pulley and two smaller ones, between which the spoke is finished. The belt is strained to the proper tension by a convenient hand-screw close to the operator.

THE SPOKE-HOLDING DEVICE contains three spokes when the machine is loaded. Each rotates automatically to turn the spoke against the polishing belt, with automatic vibrating and longitudinal movements which are secured by means of cams which govern the exact shape of the spoke to be finished. This entire device can be quickly adjusted by hand-screw for spokes of different diameters. No skill is required on the part of the operator to handle the machine, and it can be easily adjusted to suit different kinds and sizes of spokes.

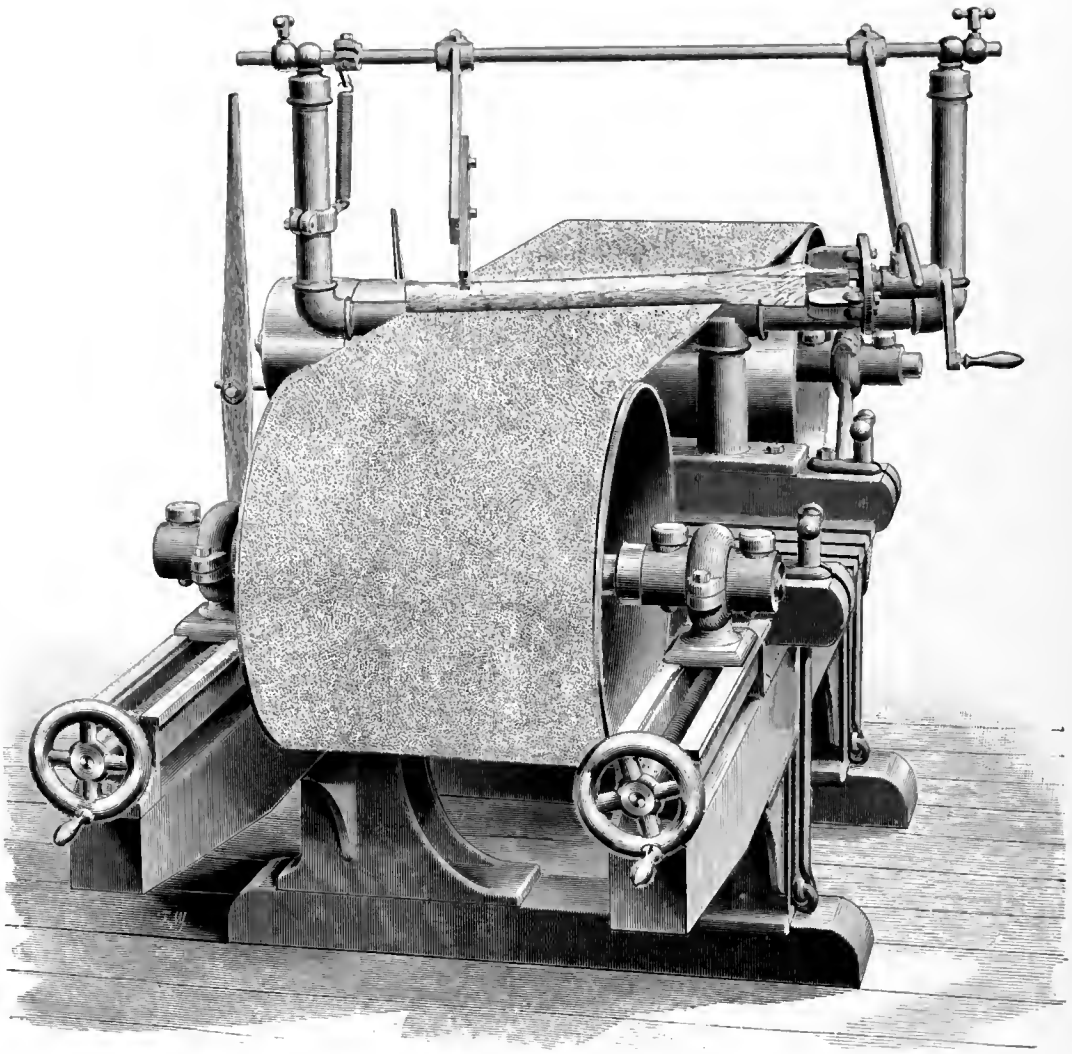
A POSITIVE FEED overcomes any variation in the work and produces a true spoke, with the diamond on the face accurately shaped.

IN OPERATING this machine when adjusted for a certain size spoke, it is simply necessary for the operator to place the work in the spoke-holding device and the finishing is automatically performed. One spoke is always finished ready to remove while the second is being polished and the third spoke is ready for the polishing belt, so that when the machine is in motion the operator is busy placing in and taking out the finished spokes.

ALL THE WEARING SURFACES are accurately scraped to bearing. All the gears are cut from the solid, and bronze boxes are used where necessary, making the machine easy, light running, and free from noise.

THE TIGHT AND LOOSE PULLEYS are 12″ diameter, 6″ face, and should run 750 turns per minute. They can be belted to from above or below.

HORSE POWER to drive, 5; floor space occupied, 84″×84″.



No. 1 Improved 18″ Belt Polishing Machine.

Export Shipping Weight, 1,800 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 70 Feet.

Cable Word, PETER.

No. 1 Improved 18″ Belt Polishing Machine.

Export Shipping Weight, 1,800 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 70 Feet.
Cable Word, PETER.

THIS ENGRAVING represents an Improved 18″ Belt Polishing Machine, which has been designed for polishing wagon and carriage spokes, neck-yokes, single-trees, whiffle-trees, handles, and various other classes of woodwork which require a high finish.

THE FRAME is heavy and substantial, with a broad floor base, a convenient height, and so constructed that the polishing belts can be placed on or removed from the pulleys without taking the machine to pieces.

THE POLISHING BELT PULLEYS are 20″ diameter, and furnished for belts 16″, 18″, or 20″ wide as ordered, 18″ being the standard width, and they are fitted upon steel spindles $1\frac{15}{16}$″ diameter, which run in genuine babbitt metal self-lubricating ball and socket bearings, which are so constructed to exclude the admission of dirt or dust.

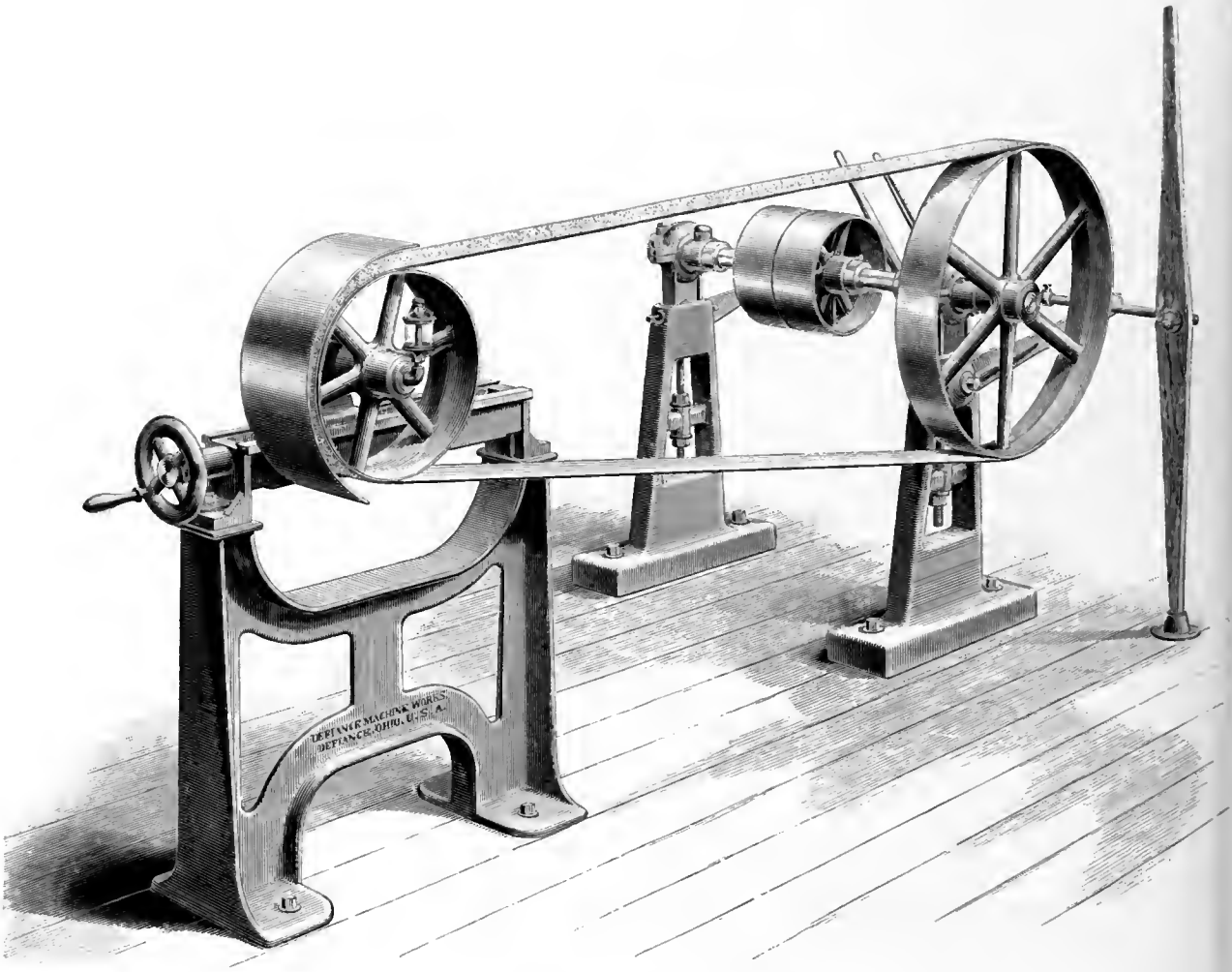
THE POLISHING BELT on this machine can be run at the rate of a mile per minute and upwards without exciting care or trouble; it is 15′ in length, and strained outward by hand wheel and screw to tighten the belt, having adjustment sufficient to accommodate a variation of 2′ in length of the belt.

ALL THE RUNNING PARTS are balanced on our patent centrifugal balancing machine by which a true running balance is secured, and all the rotating parts are guaranteed to run true and smooth, free from vibration, a feature which cannot be claimed for polishing machines of any other make.

THE ATTACHMENTS FOR HOLDING THE WORK while polishing can be adjusted to any angle across the belt, and it is fitted with a counter balance spring to automatically lift the attachment from the belt when not in use; one end of the stock to be polished is held in an adjustable chuck, the other end turning in a circular shoe, and when presented to the action of the belt is revolved by the hand lever shown; an automatic attachment to revolve the work is furnished at an extra cost when ordered.

THIS MACHINE is a general favorite where used, due to good workmanship and accuracy in running parts. It is furnished complete with attached counter and belt shipper, and is ready to run when received. The tight and loose pulleys are 10″ diameter, 6″ face, and should run 1,000 rotations per minute; it can be belted to from above, below or either side.

HORSE POWER to drive, 2½; floor space occupied, 48″×84″.



No. 2 Single Belt Polishing Machine.

Export Shipping Weight, 900 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 25 Feet.

Cable Word, PAUL.

No. 2 Single Belt Polishing Machine.

Export Shipping Weight, 900 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 25 Feet.

Cable Word, PAUL.

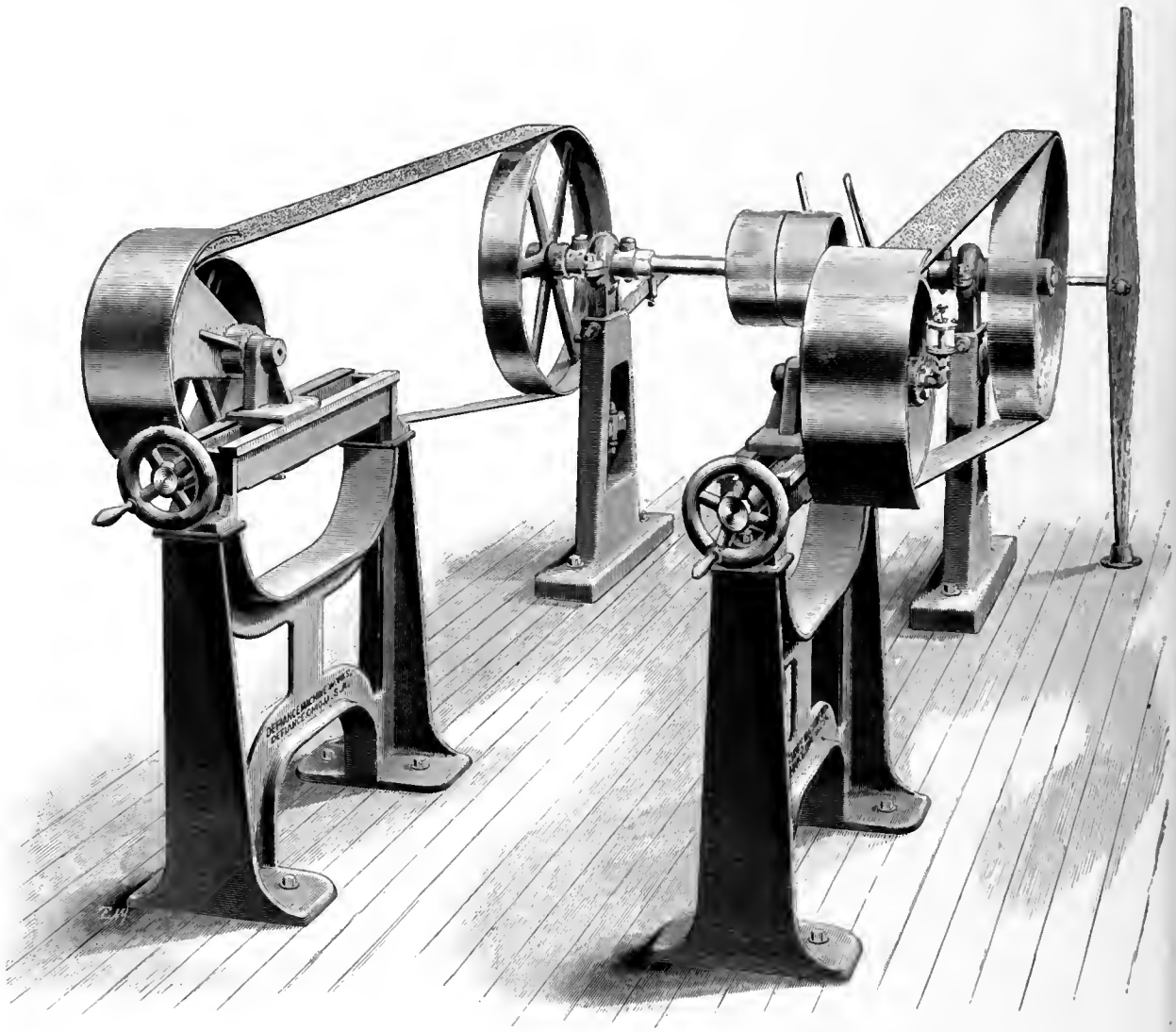
THE ENGRAVING represents our Improved No. 2 Single Belt Polishing Machine for use of belts covered with flint quartz, for finishing the throat or neck of spokes, single-trees, neck-yokes, shafts, poles, handles, wagon and carriage gearing, and other similar classes of woodwork; equally well adapted for finishing iron or steel by the use of emery belts. All of the bearings are so inclosed as to prevent the admission of dust or sand, and the machine is built throughout on the most improved plan.

THESE MACHINES are usually furnished with pulleys for 3″ belts. Wider faces to 10″ can be supplied when so ordered. The driving pulley and strainer stand are independent of each other; can be set any desired distance apart, not being limited to any certain amount of range for length of sand belt. In many cases it may be desirable or necessary to use an extremely long or short belt. By discarding the use of a frame, such as are common to machines of this kind to connect counter and strainer, any length of belt can be used to best suit the requirement, as well as permitting the operator to work on either side of the belt or close to the pulleys.

THE STRAINER PULLEY is 12″×3½″, furnished with a self-oiling device which is warranted in every particular, and it is strained outward by hand wheel and screw to tighten the sand belt, having an adjustment to accommodate a variation of 24″ in length of belt. The saddle supporting the strainer pulley is fitted to the stand in planed angle ways which are nicely fitted.

THE COUNTER is a portion of the machine. Shaft 1 1/16″ diameter, 38″ long; driving pulley, 24″×3½″; one shipper complete; three 1 1/16″ collars, two No. 2 floor stands, 1 1/16″ ball and socket boxes; tight and loose pulleys, 10″×4″, for 3″, 4″, 5″, and 6″ machine, and 10″×5″ for 8″ and 10″ machine; speed, 800 revolutions per minute, giving 4,800 feet belt speed. All the running parts are balanced true on our patent centrifugal balancing machine, and they are capable of running at the rate of a mile a minute and upwards without exciting care or trouble.

HORSE POWER to drive, ½; floor space occupied, 38″×96″.



No. 2 Double Belt Polishing Machine.

Export Shipping Weight, 1,300 Pounds.
Net Weight, 900 Pounds.
Cubic Measurement, 30 Feet.
Cable Word, PARTING.

No. 2 Double Belt Polishing Machine.

Export Shipping Weight, 1,300 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 30 Feet.

Cable Word, PARTING.

THIS MACHINE as represented by the engraving contains several desirable features over other machines intended for the same purpose. The large sale of this class of polishing machines furnishes sufficient evidence of their superiority. The absence of a cumbersome frame enables the operator to work close to and reach any portion of the belts, or work on either side, and when the machine is not in use the belts can be removed and but little space is occupied. It is especially recommended for finishing spokes, neck-yokes, single-trees, wagon and carriage gearing, shafts, poles, handles, and other wood work. Emery belts can be used for finishing iron or steel with equal success.

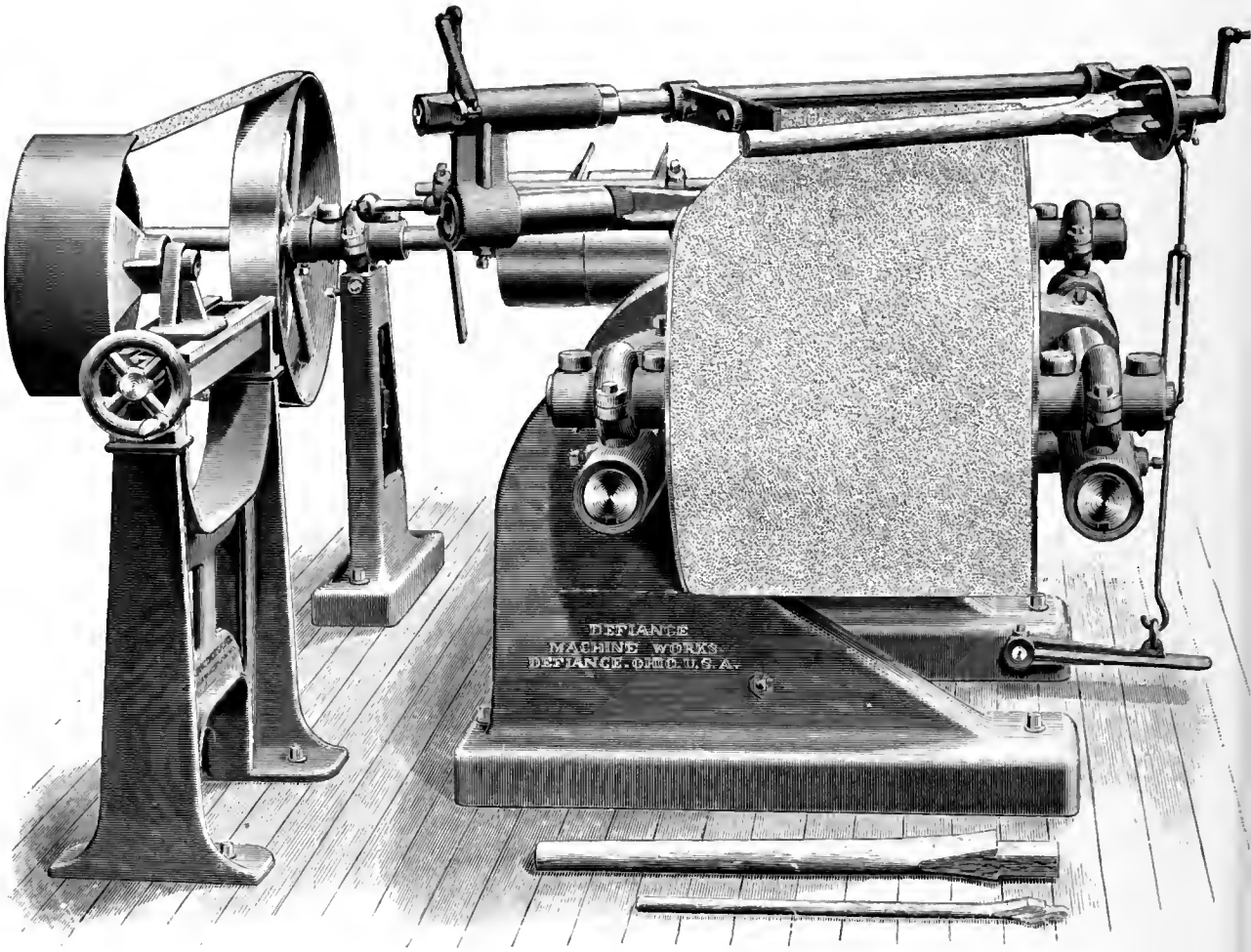
IT HAS few and simple adjustments; the strainer stands are independent of the counter; can be placed any desired distance apart for short or long belts; the portion of the floor occupied by the operator is entirely disencumbered, thus securing a neatness of appearance and convenience which cannot be claimed for polishing machines heretofore used.

THE STRAINER PULLEYS are 12″ diameter, 3½″ face, and are fitted with a self-oiling device, which is warranted in every particular, and they are strained outward by hand wheel and screw to tighten the sand belt, having an adjustment sufficient to accommodate a variation of two feet in length of belt. The saddles supporting the strainer pulleys are fitted into angular ways and provided with adjustable gibs.

THE COUNTERSHAFT is $1\frac{15}{16}$″ diameter, 60″ long, supported at either end by substantial floor stands, with ball and socket adjustable boxes. The driving pulleys are 24″×3½″; tight and loose pulleys, 10″×4″ for 3″ and 4″ machine, 10″×5″ for 5″ and 6″ machine, and 10″×6″ for 8″ and 10″ machine; speed, 800 rotations per minute, giving 4,800 feet belt speed.

ALL THE RUNNING PARTS are balanced on our patent centrifugal balancing machine, and they can be run at the rate of a mile a minute and upwards without exciting care or trouble.

HORSE POWER to drive, 1; floor space occupied, 60″×96″.



No. 3 Iron Frame Double Belt Polishing Machine.

Export Shipping Weight, 2,900 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, PICCOLO.

No. 3 Iron Frame Double Belt Polishing Machine.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 93 Feet.
Cable Word, PICCOLO.

THIS ENGRAVING represents our new No. 3 Iron Frame Double Belt Polishing Machine, of modern design and superior construction. It is used for polishing woodwork of various kinds, including spokes, handles, shafts, poles, neck-yokes, single-trees, wagon axles, sand boards and other classes of work. It is very convenient to operate, and a large amount of perfect work can be expected from it. It is equipped with a wide and narrow polishing belt, enabling two operators to work on the machine at one time.

THE FRAME, of iron, is heavy and substantial, with a broad base. It is so constructed that either of the polishing belts can be quickly placed on the pulleys or removed without disconnecting any of its parts.

THE POLISHING BELTS are usually furnished as follows: One 3″ wide and one 18″ wide. For the 3″ a 4″, 5″, 6″ or 8″ can be substituted if so ordered. They are 16 feet 8″ long and strained outward by hand-screws to tighten the belts, having adjustments sufficient to accommodate 2 feet in the length of the belts.

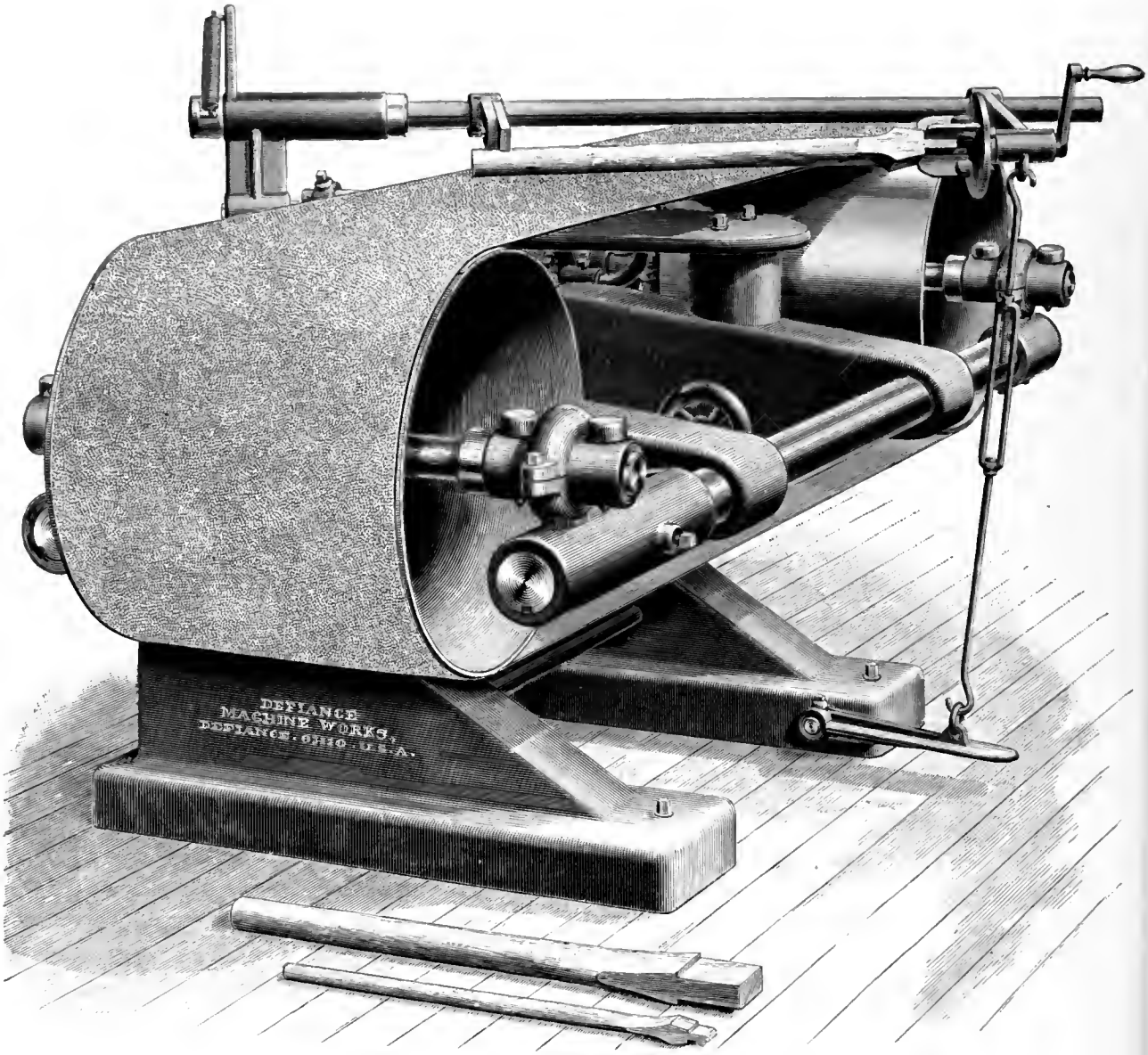
THE PULLEYS are balanced by our patent balancing system, and they are guaranteed to run at the rate of a mile per minute and upwards, entirely free from jar or vibration. The loose pulleys are fitted with bronze bushes and self-oiling devices, and all the bearings are inclosed to prevent the admission of dust or dirt.

AN INGENIOUS DEVICE is furnished on the 18″ belt for holding the work while polishing. It can be adjusted to any angle across the belt, to accommodate short or long work. It is fitted with a spring balance to automatically lift the attachment from the belt when not in use. The work to be polished is held at one end in a revolving chuck, the other end turning in a circular shoe. It is presented to the action of the belt by the weight of the operator's foot upon a pedal at the base of the machine. One or two rotations of the work on the belt completes it.

A SMOOTH RUNNING MACHINE is necessary for rapid and accurate polishing, and this essential feature, coupled with good workmanship, can only be found in the Defiance machines, and where used are general favorites with the operators.

THE COUNTER is a portion of the machine. The tight and loose pulleys are 10″ diameter, 6″ face, and should run 1,000 turns per minute, giving 5,000 feet speed to the polishing belts. A convenient belt shipping apparatus is furnished for starting and stopping the machine, which can be belted to from above or below.

HORSE POWER to drive, 2; floor space occupied, 60″×94″.



No. 4 Iron Frame Belt Polishing Machine.

Export Shipping Weight, 2,500 Pounds.

Net Weight, 1,800 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, PENNSYLVANIA.

No. 4 Iron Frame Belt Polishing Machine.

Export Shipping Weight, 2,500 Pounds.
Net Weight, 1,800 Pounds.
Cubic Measurement, 93 Feet.
Cable Word, PENNSYLVANIA.

THIS ENGRAVING represents our No. 4 Iron Frame Belt Polishing Machine, with a polishing belt 18″ wide, which has been designed with the greatest care for polishing wagon and carriage spokes, neck-yokes, single-trees, whiffle-trees, handles of all kinds, and various other classes of woodwork requiring a high finish. It is heavy and well made and very convenient to operate, and a large amount of perfect work can be accomplished with it.

THE FRAME, of iron, consists of heavy cored sections of neat design and provided with a broad floor base, so constructed that the polishing belt can be instantly placed on or removed from the machine without disconnecting any of the parts.

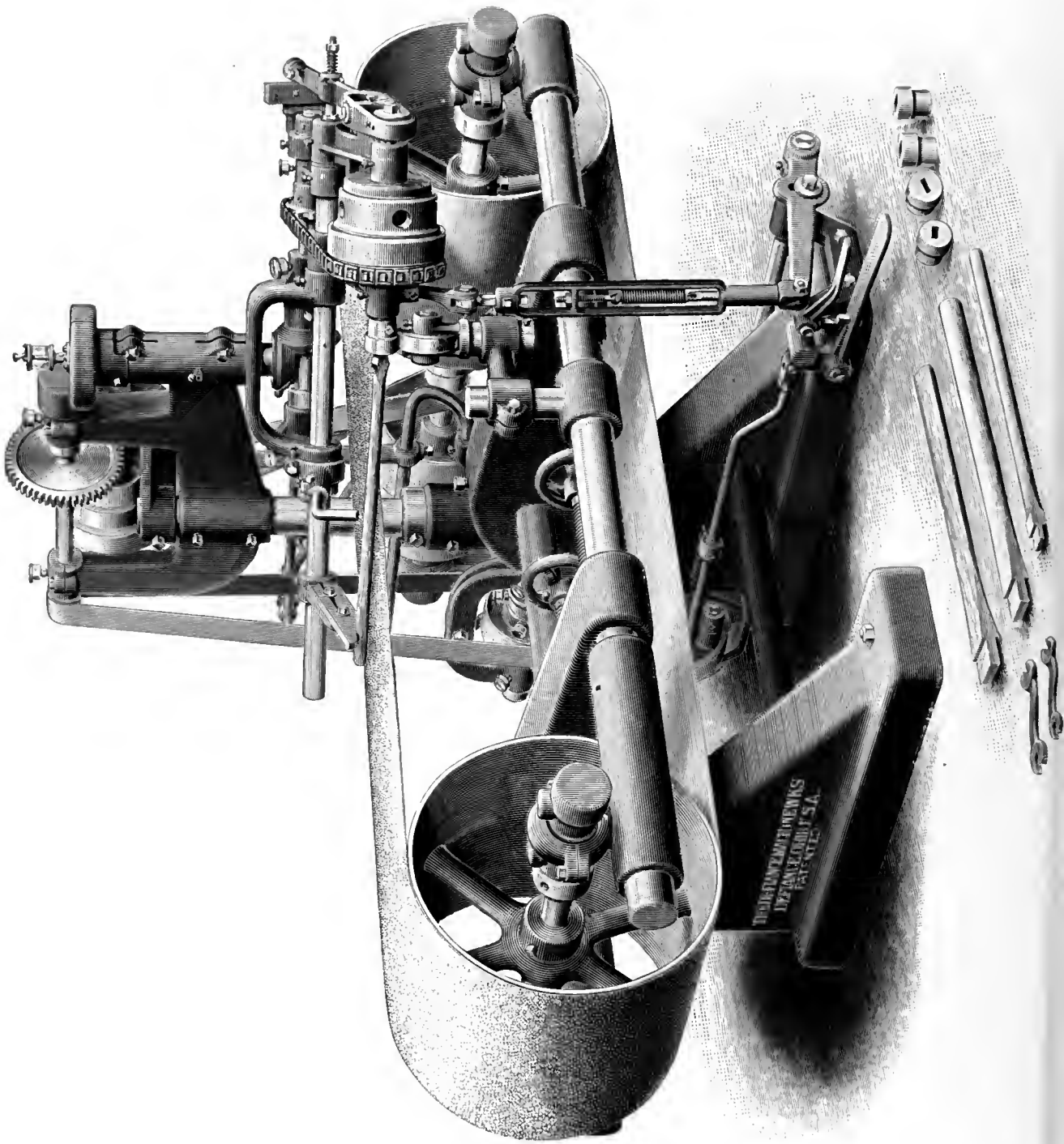
THE POLISHING BELT PULLEYS are 20″ diameter, 18″ face, and supported upon heavy steel spindles running in long, genuine babbitt metal, self-lubricating bearings, so inclosed to prevent the admission of dust and dirt. They are balanced on our patent balancing system, and guaranteed to run at the rate of a mile per minute and upwards, entirely free from jar or vibration. They are supported upon heavy steel parallel bars fitted through bored and reamed holes in the main frame, making a substantial job.

THE POLISHING BELT is 18″ wide, 16 feet 8″ long, made endless, with the outside surface covered with flint quartz, and it is strained outward by convenient hand-wheels on the inside of the frame, out of the way, to tighten the belt, having an adjustment to accommodate a variation of 2 feet in the length of the belt.

THE WORK to be polished is held in a very ingenious and convenient attachment which can be adjusted to any angle across the belt for either short or long work, and it is fitted with a spring balance to automatically lift the attachment from the belt when not in use. The work is held at one end in a revolving chuck, and the other end turning in a circular shoe, and it is presented to the action of the polishing belt by the weight of the operator's foot upon the pedal at the base of the machine, and while resting upon the belt is rotated by hand until polished. One or two revolutions is sufficient for work that is well turned and shaped.

THE TIGHT AND LOOSE PULLEYS are attached to the machine. They are 10″ diameter, 6″ face, and fitted with bronze bushes and self-oiling devices and a convenient belt shifter for starting and stopping the machine. They should run 1,000 turns per minute, giving 5,000 feet speed to the polishing belt.

HORSE POWER to drive, 2; floor space occupied, 43″×94″.



No. 6 Patent Automatic Belt Polishing Machine.

Export Shipping Weight, 3,800 Pounds.

Net Weight, 3,000 Pounds.

Cubic Measurement, 188 Feet.

Cable Word, PANHARD.

THIS ENGRAVING represents our No. 6 Patent Automatic Belt Polishing Machine, especially designed for rapidly and accurately polishing to pattern, automobile, carriage and wagon spokes, handles, single-trees, neck-yokes, whiffle-trees and other classes of turned woodwork requiring a high finish. Its capacity is sufficient to properly finish about 8,000 large or 15,000 small spokes in ten hours and other work in proportion.

BY THE OLD METHOD of polishing by hand it was impossible to retain the exact shape of the turned work as it left the turning lathe, neither could the work be accomplished rapidly, and by the use of this new machine the exact shape of the turning is maintained, smoother and better work secured, with three times greater capacity and with unskilled labor to do the work.

THE FRAME is constructed of heavy cast iron sections with a wide floor base to stand firm, so designed that the polishing belt can be placed on or off the pulleys without disconnecting any of its parts.

THE POLISHING BELT PULLEYS are 20″ diameter, 18″ face, and they are given a running balance. They are supported upon heavy steel spindles, which rotate in self-lubricating bearings so enclosed as to prevent the admission of dust or dirt.

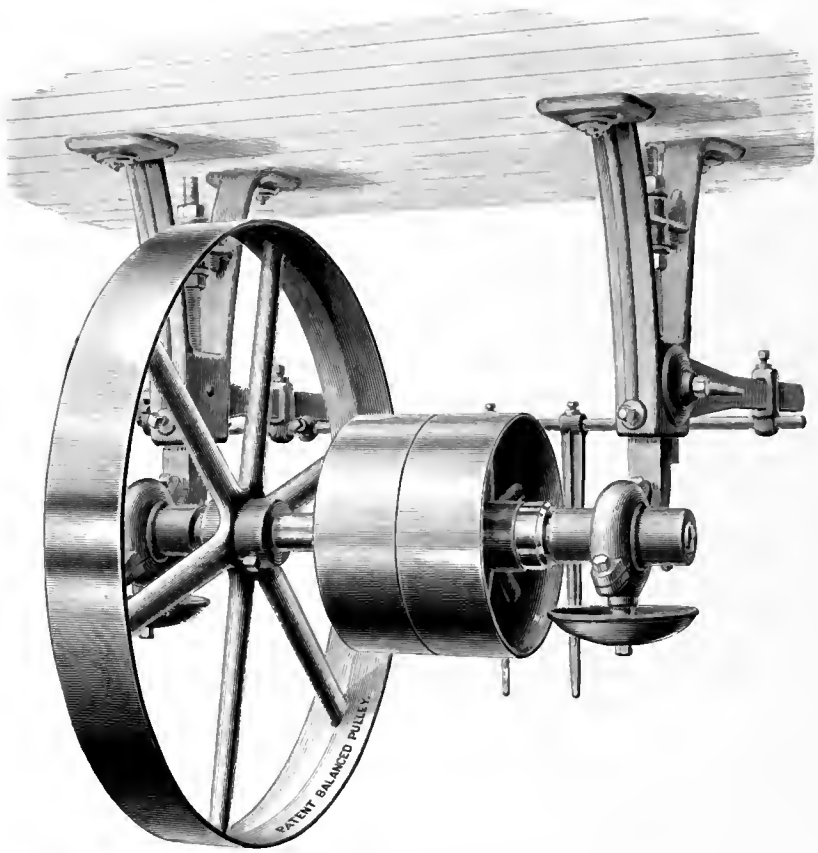
THE POLISHING BELT is 18″ wide, 16 feet 8″ long, made endless, with the outside surface covered with polishing material. It is strained outward by two convenient hand screws with sufficient adjustment to accommodate a variation of two feet in the length of the belt.

THE AUTOMATIC DEVICE to hold and rotate the work on the polishing belt is so constructed that the operator has both hands free to place in the work and remove the finished product, as the work is automatically rotated when the work is against the belt and automatically stopped when elevated from it for the removal of the work.

THE PATTERN used should be of the exact shape of the finished product. It consists of a small inexpensive cast iron cam or collar held to the spindle by a single set screw.

THE TIGHT AND LOOSE PULLEYS are 10″ diameter, 5″ face, and should run 1,000 turns per minute, giving about 4,800 feet polishing belt speed.

HORSE POWER to drive, 1; floor space occupied, 48″ × 62″.



Improved Counters,

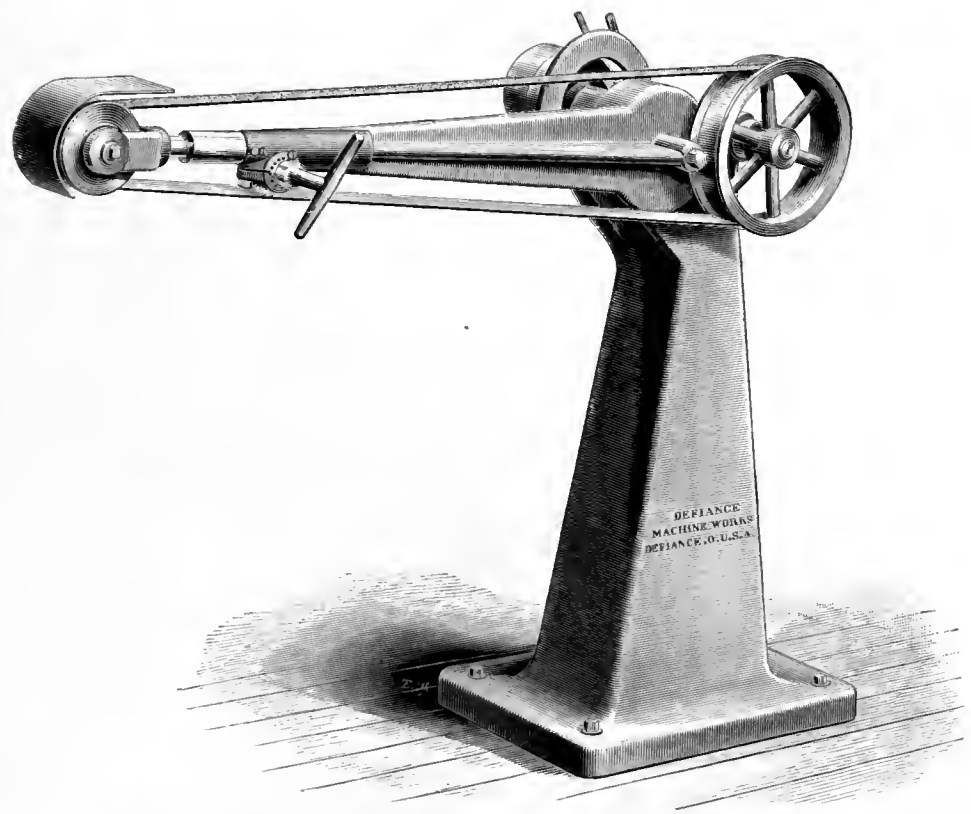
With Patent Balanced Pulleys.

Cable Word, COON.

THIS ENGRAVING represents an improvement in the construction of counters. It is equipped with a true shaft, ball and socket adjustable "J" drop hangers, fitted with an adjustable belt shipping apparatus, with running balanced pulleys.

THEY ARE furnished in all sizes for light or heavy service, with shafts from $1\frac{7}{16}$" to $5\frac{15}{16}$" diameter, any length, and pulleys in proportion, and they are especially recommended for driving wood-working, electrical, and other high speed machines, when a steady motion is desired.

THERE IS no piece of machinery which communicates so much objectionable jar and vibration to building and floor as that combination of pulleys, shaft, and hangers known as a "Counter." Economy of power, and the elimination of the objection mentioned, demand pulleys balanced by the only known method of balancing, namely, "The Rotary System." This system, invented by us, and under several patents, we have had in continual use for many years, and have never failed to secure a perfect "running balance" with every pulley furnished. For a complete understanding of this subject we respectfully refer our patrons to our pamphlet entitled "Properties of the Rotating Parts of Machinery."



No. 0 Adjustable Arm Belt Polishing Machine.

Export Shipping Weight, 700 Pounds.
Net Weight, 400 Pounds.
Cubic Measurement, 20 Feet.
Cable Word, PAINT.

THIS ENGRAVING represents our No. 0 Improved Adjustable Arm Belt Polishing Machine, which is calculated to carry a polishing belt up to 2″ wide. It has been designed especially for the lighter and finer kinds of polishing, such as small handles and other wooden articles requiring a high finish; by the use of emery belts it will be found a most convenient machine for finishing iron and steel, especially such work as polishing the joints of bicycle frames, etc.

THE BODY of the machine is of neat design, it is cast in one piece with cored center, and of sufficient weight to stand firm, even without fastening to the floor.

THE PROJECTING ARM can be quickly set up or down the desired height from the floor to best suit the operator and nature of the work; the pulley at the outer end of the arm is covered with a shield and furnished with a self-oiling device, which is dirt proof and warranted not to heat; it is strained outward by a steel rack and pinion to tighten the belt.

THE POLISHING BELT is 10 feet in length, and furnishes a large amount of wearing surface. All the wearing parts are so accurately balanced that the belt can be run at the rate of a mile per minute without jar or vibration.

THIS MACHINE is furnished with an attached counter, including belt shipper; it can be belted to from above, below, or either side, and when received is ready to run when the power is applied.

THE DRIVING PULLEY is 10″×2″; pulley at end of arm, 4″×2″; tight and loose pulleys, 6″×2″; speed, 1,600 revolutions per minute.

HORSE POWER to drive, ½; floor space occupied, 24″×48″.

No. 1 Adjustable Arm Belt Polishing Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 750 Pounds.

Cubic Measurement, 34 Feet.

Cable Word, POWERFUL.

No. 1 Adjustable Arm Belt Polishing Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 750 Pounds.

Cubic Measurement, 34 Feet.

Cable Word, POWERFUL.

THIS ENGRAVING represents a belting machine, having an adjustable arm which can be set up or down to suit a short or tall operator; it is usually furnished with pulleys to carry a sand belt 4″ wide, although it can be fitted with pulleys up to 6″ wide when so ordered. It is intended for polishing the inner curve of rims and felloes, spokes, handles, neck-yokes, single-trees, chair stuff and other classes of woodwork, either regular or irregular in form. Emery belts can be used with equal success, with which to polish iron or steel.

THE BODY of the machine, or truncated post, is cast in one piece, cored out, of sufficient weight to secure stability even without fastening to the floor, although it is not unnecessarily heavy and consumes but little floor space.

THE PORTION of the floor occupied by the operator is entirely disencumbered, thus securing a neatness of appearance and a convenience that cannot be claimed for polishing machines heretofore used.

THE PROJECTING ARM is adjustable to any desired height from the floor. Length of belt, 15 feet 4″. Variation of belt, 12″.

THE PULLEY at the outer end of the arm is furnished with a self-oiling device which is warranted in every particular. It is strained outward by a steel rack and pinion to tighten the sand belt.

THE BELTS on this machine have been run at the rate of a mile a minute and upwards without exciting care or trouble.

THE MACHINE is furnished with attached counter, including belt shipping apparatus, etc. It can be belted from above, below, or either side, and is ready for use without the usual painstaking work of putting up the counter and fastening parts to the floor.

THE DRIVING PULLEY is 24″ diameter by any width of face desired, usually for 4″ belt. Tight and loose pulleys, 10″ × 4″; speed, 800 revolutions per minute, giving 4,800 feet belt speed.

HORSE POWER to drive, 1; floor space occupied, 24″ × 62″.

No. 2 Adjustable Arm Belt Polishing Machine.

Export Shipping Weight, 1,300 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 52 Feet.

Cable Word, POLAND.

No. 2 Adjustable Arm Belt Polishing Machine.

Export Shipping Weight, 1,300 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 52 Feet.

Cable Word, POLAND.

THIS ENGRAVING represents an improved No. 2 special heavy belting machine, which can be fitted with pulleys to carry a polishing belt 7″, 8″, 9″, or 10″ wide, as ordered. It is intended for polishing spokes, neck-yokes, single-trees, shafts, poles, handles, chair, wagon and carriage woodwork, etc. By the use of a belt covered with emery, it can be used for polishing iron or steel.

THE BODY of the machine is cast in one piece with cored center, and it is of sufficient weight to stand firm even without fastening to the floor. It occupies a small amount of room.

THE PROJECTING ARM can be adjusted the desired height from the floor to suit a short or tall operator, and it will accommodate a variation of 2 feet in length of the sand belt, taking a 16 foot belt at the longest.

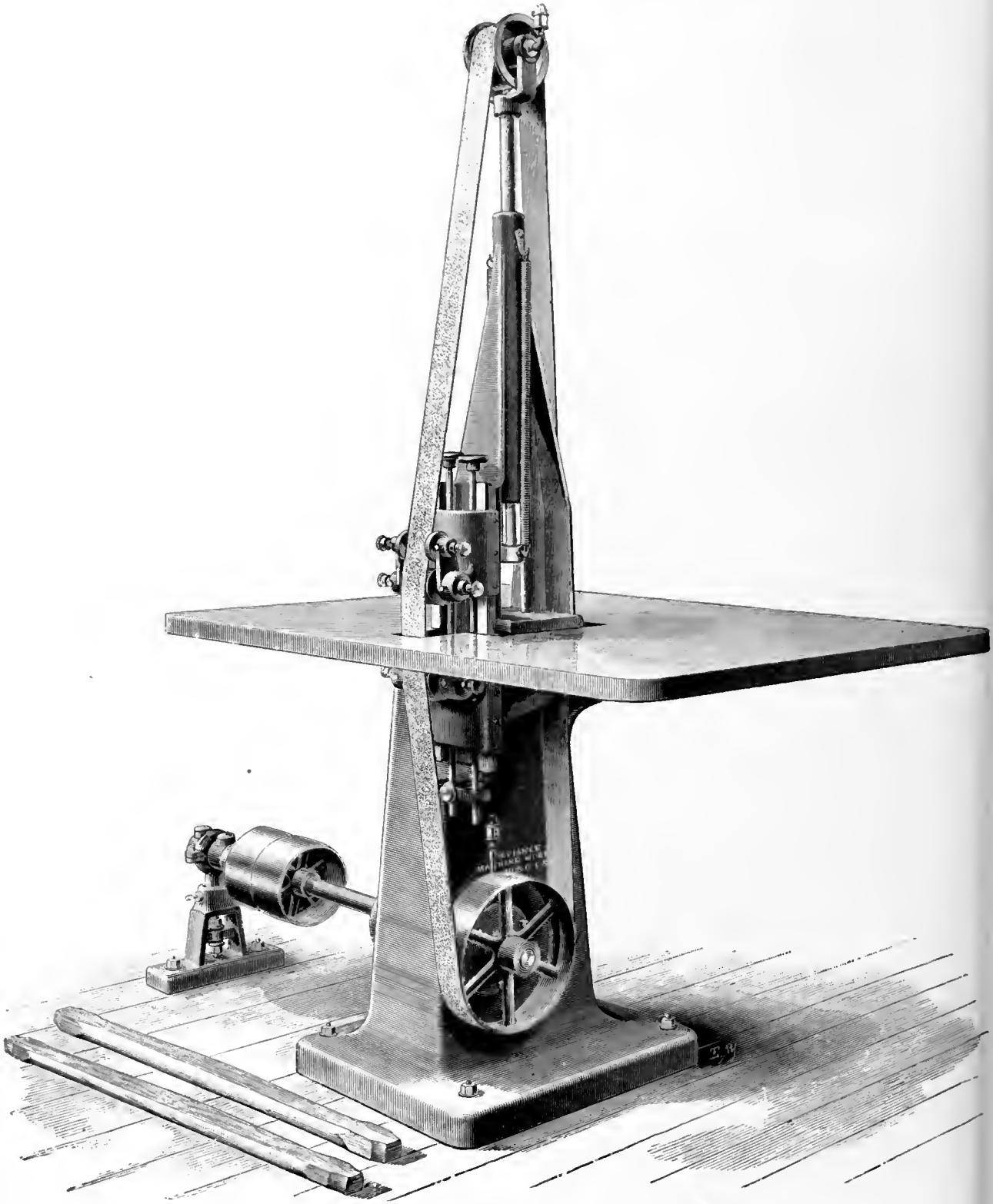
THE PULLEY at the outer end of the adjustable arm is covered with a shield, and furnished with an improved self-oiling device, so arranged that dust or dirt cannot enter the bearings, and warranted not to heat; it is strained outward by a steel rack and pinion to tighten the belt, and provided with a radial movement for adjusting it in line with the driving pulley, and to prevent the belt from running to one side when unequal stretch of the belt occurs.

SO ACCURATELY are the running parts balanced that the belt can be run at the rate of a mile per minute and upwards without jar or vibration.

THIS MACHINE is furnished with an attached counter, including belt shipper; it can be belted to from above, below, or either side, and when received is ready for use.

THE DRIVING PULLEY is 24″ diameter, with face from 7″ to 10″, as ordered; the tight and loose pulleys are 10″ × 5″; speed, 800 rotations per minute, giving 4,800 feet belt speed.

HORSE POWER to drive, 1½; floor space occupied, 24″ × 62″.



No. 0 Vertical Flexible Belt Polishing Machine.

Export Shipping Weight, 2,200 Pounds.
Net Weight, 1,600 Pounds.
Cubic Measurement, 88 Feet.
Cable Word, PANTHER.

No. 0 Vertical Flexible Belt Polishing Machine.

Export Shipping Weight, 2,200 Pounds.

Net Weight, 1,600 Pounds.

Cubic Measurement, 88 Feet.

Cable Word, PANTHER.

THIS ENGRAVING represents our No. 0 Vertical Flexible Belt Polishing Machine, which has been designed for polishing the curved or irregular surfaces of wooden articles, such as are used in the construction of wagons and carriages, sleighs, and agricultural implements. Previous to its introduction this work was accomplished either by hand labor, which was slow and expensive, or by the aid of a horizontal polishing belt which necessitated the holding of the work in the hands of the operator and swinging it from right to left to reach all the parts to be finished, which was also a tedious and laborious process.

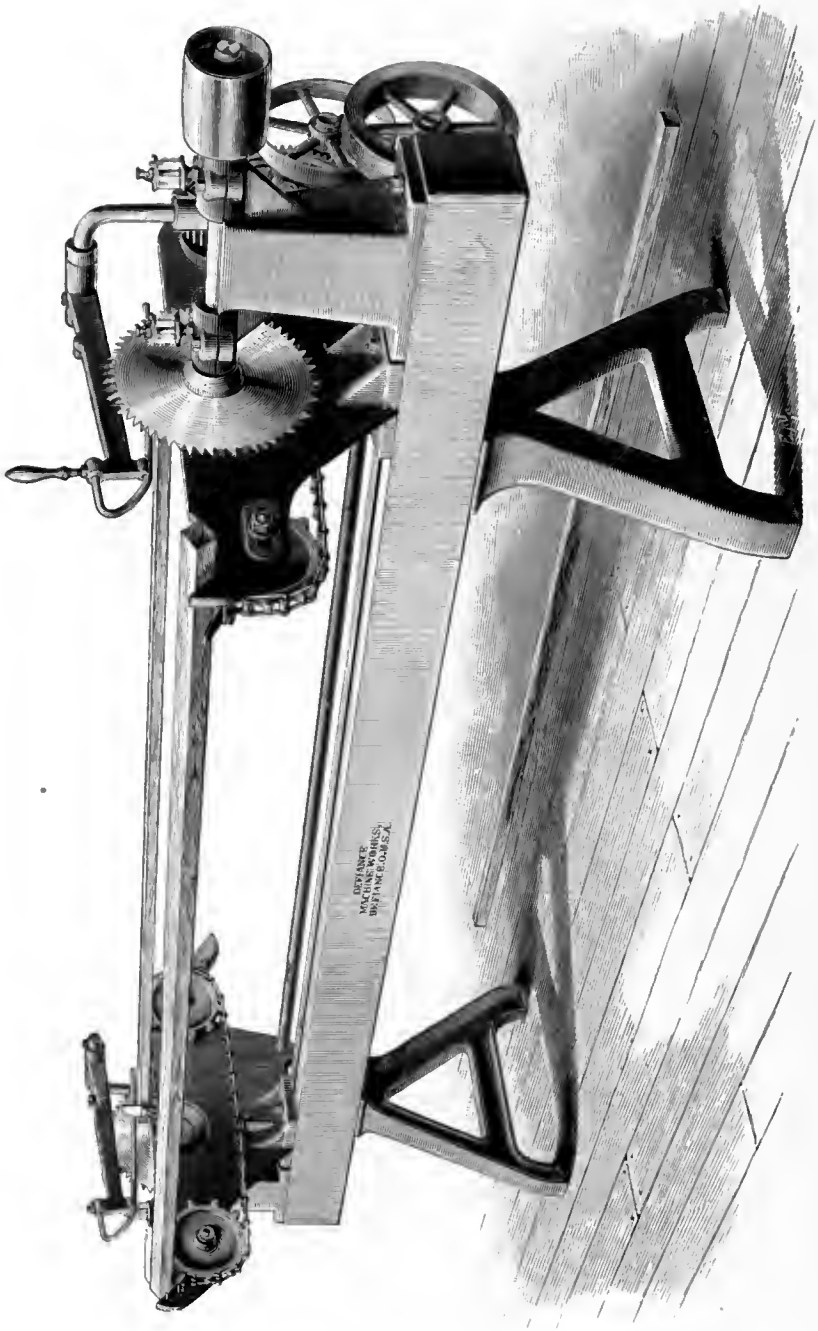
BY THIS INGENIOUS DEVICE the operator is not obliged to hold the weight of the piece to be polished or swing it, simply placing it upon the table, pressing it against the flexible belt, which immediately accommodates itself to the curved surface, and by moving the object forward does the polishing smooth, uniform, and more rapidly than by any other method.

THE FRAME is cast in one piece with cored center, with a broad floor support. The table, of iron, is 44″×60″, and it is planed true and smooth on top.

THE POLISHING BELT is 4″ wide and runs over an idler pulley at the top which is fitted with spring balances, by which means a most delicate adjustment of the belt to the work is secured. All the loose pulleys and guide rolls are fitted with bronze bearings and self-oiling devices.

THE TIGHT AND LOOSE PULLEYS are 8″×4″; speed, 1,300 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, 60″×60″.



No. 2 Patent Automatic Double Equalizing Machine.

Export Shipping Weight, 4,900 Pounds.
Net Weight, 3,700 Pounds.
Cubic Measurement, 278 Feet.
Cable Word, SPEED.

No. 2 Patent Automatic Double Equalizing Machine.

Export Shipping Weight, 4,900 Pounds.
Net Weight, 3,700 Pounds.
Cubic Measurement, 278 Feet.
Cable Word, SPEED.

THIS ENGRAVING represents our No. 2 Automatic Double Equalizing Machine, which has been designed for automatically cutting off both ends of material at one time, such as rim or felloe strips to prepare them for the bending machine, and for equalizing spokes, handles, neck-yokes, single-trees, and other classes of woodwork, and preparing it for the turning lathe.

IT IS provided with all the necessary adjustments to equalize material from 12″ up to 12 feet in length. This adjustment is secured by turning a single hand-wheel, and it can be set for different lengths of work while the machine is in motion. By its use an immense saving is effected. A single pass of the material through the machine cuts off both ends square and true, reducing each piece to exact length. The operator simply places the material upon the table and it is fed through the machine automatically by an endless chain feed, and discharged at the rear side.

THE WORKING PARTS are mounted upon a substantial iron frame cast in one piece, with cored center. The upper surface is planed true, with the arbor stands and feeding brackets neatly fitted to it.

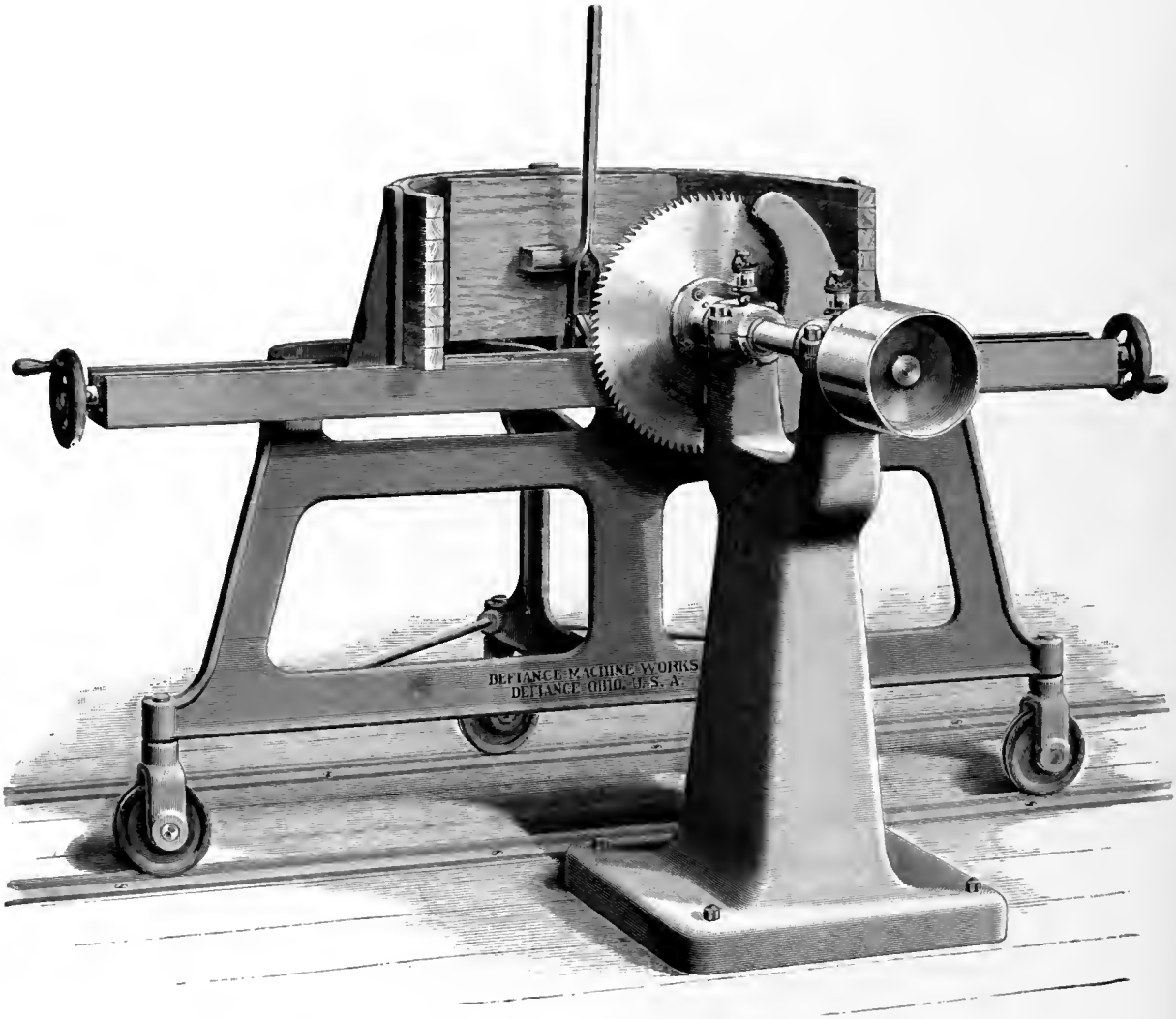
THE SAW ARBORS, of steel, are large in diameter, and fitted into substantial bearings. The one on the left hand side of the machine is fitted to a long screw provided with a hand-wheel to adjust the saw and feeding bracket horizontally for work of different lengths. Any desired adjustment can be quickly secured.

THE FRICTION FEED is of the most rapid and positive kind, and so constructed that it can be instantly started or stopped while the machine is in motion.

THE OPERATOR has complete control over the machine from the working side. Cheap labor will handle it successfully and make all the necessary adjustments. The material to be equalized is simply placed upon the table and automatically delivered to the saws and discharged at the rear side of the machine.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}'' \times 18$ feet long; three No. 3 ball and socket adjustable drop hangers; one driving pulley, $16'' \times 5''$; one driving pulley, $16'' \times 96''$ face; pulley to drive feed, $7'' \times 3''$; tight and loose pulleys, $12'' \times 6''$; speed, 900 rotations per minute.

HORSE POWER to drive, 2½; floor space occupied, $48'' \times 186''$.



No. 2 Improved Rim Packing and Cut-Off Machine.

Export Shipping Weight, 1,700 Pounds.

Net Weight, 1,100 Pounds.

Cubic Measurement, 63 Feet.

Cable Word, SWIFT.

No. 2 Improved Rim Packing and Cut-Off Machine.

Export Shipping Weight, 1,700 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 63 Feet.
Cable Word, SWIFT.

THIS ENGRAVING represents our new No. 2 Improved Rim Packing and Cut-Off Machine, which is used by the makers of bent rims or felloes for wagon and carriage wheels. After the rims are bent on the bending machine, they are placed into the traveling carriage of this machine, as shown, between the self-centering jaws, and packed together to a uniform circle, making them all register alike, and when in this position, the carriage is moved to the saw and a small surplus is cut off from both ends of each rim. A wooden strip is then nailed across to the ends on the rim when the package is prepared for shipment.

IT IS SO CONSTRUCTED that for very large bending factories special long tracks can be used with two of the traveling carriages on them, so that two sets of operators can use the same saw and produce double the amount of work.

THIS MACHINE is built of iron and steel throughout. The saw arbor pedestal is a heavy casting in one piece, with cored center and broad floor base.

THE SAW ARBOR, of steel, of large diameter, runs in bronze bearings which are fitted into bored holes, and they are equipped with self-oiling cups.

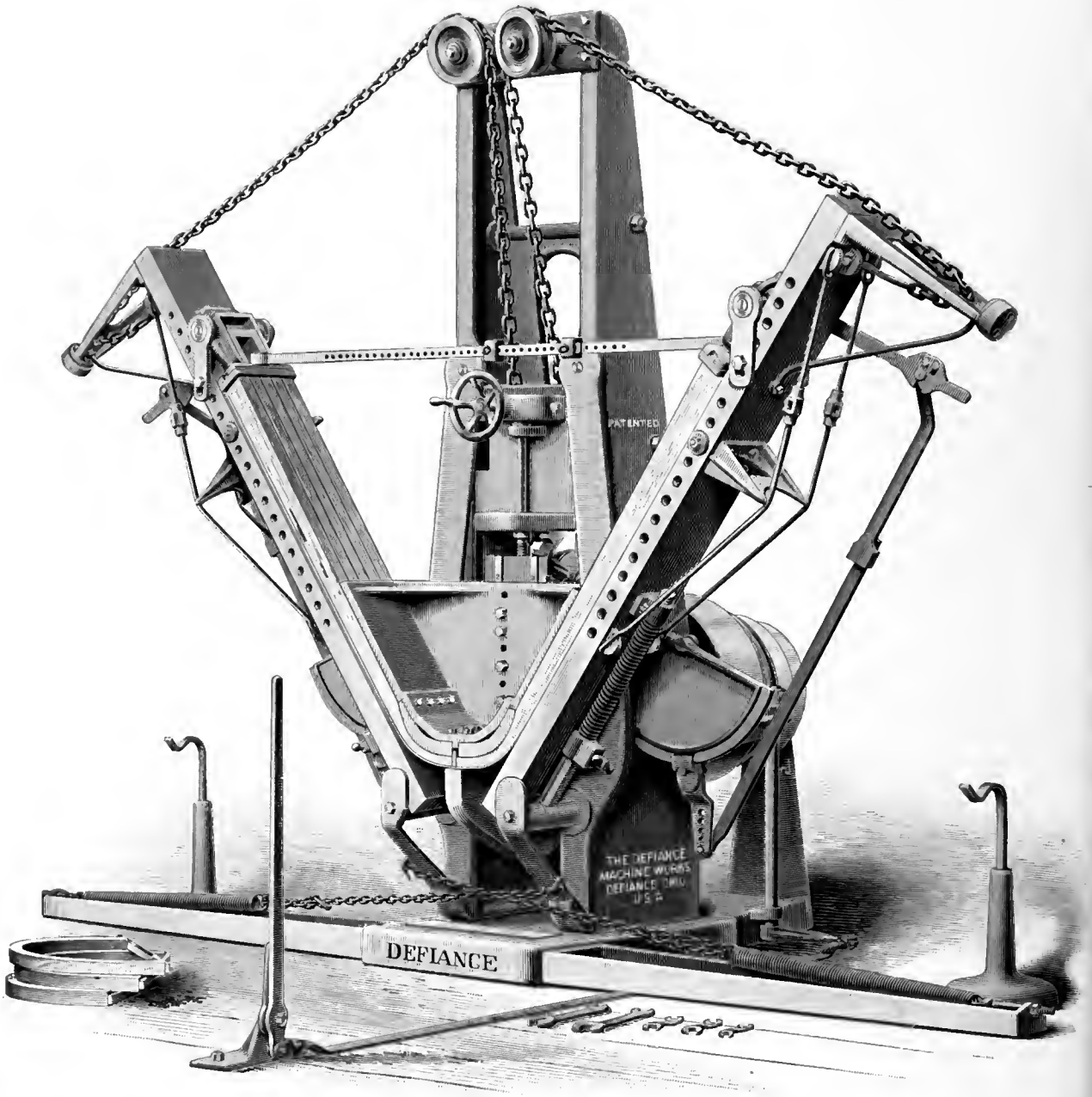
The saw used is 16″ diameter and fitted to the face of flange with countersunk bolts, making it flush on the face side.

THE TRAVELING CARRIAGE is fitted with three friction rollers which are turned true and they travel upon a V shaped wrought-iron track, and they run with great ease. The jaws for holding the rims are fitted to the carriage in planed ways. Their faces are also planed true and square with the carriage. The two jaws standing directly opposite each other are actuated simultaneously by turning the hand-wheel at either end of the carriage. The center jaw has an independent adjustment, and it acts merely as a gauge. A single adjustment of it answers for all work of one diameter. Adjustments sufficient to accommodate rims from 18″ to 6 feet diameter can be secured.

IT WILL pack rims perfectly and do the work in the shortest possible time, and wherever used becomes a general favorite. The uniform packing of rims constitutes one of the essential features of rim making.

THE COUNTER is furnished as follows: Two No. 1 ball and socket adjustable drop hangers; shaft, $1\frac{1}{16}'' \times 48''$; driving pulley, $24'' \times 6''$; tight and loose pulleys, $10'' \times 6''$; speed, 650 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, $72'' \times 138$.



No. 40 Patent 9″ Variety Wood Bending Machine.

Export Shipping Weight, 6,100 Pounds.

Net Weight, 4,700 Pounds.

Cubic Measurement, 139 Feet.

Cable Word, BRAZZA.

No. 40 Patent 9″ Variety Wood Bending Machine.

Export Shipping Weight, 6,100 Pounds.

Net Weight, 4,700 Pounds.

Cubic Measurement, 139 Feet.

Cable Word, BRAZZA.

THIS ENGRAVING represents our No. 40 Patent 9″ Variety Wood Bending Machine, designed for bending wagon, carriage and automobile felloes, hames, plow handles, chair stock and a great variety of other shapes. It will bend from light material up to 4″ thick, 9″ wide, either in one piece or pieces sufficient to fill this space, and to various circles according to the shape of the form used.

THE FRAME is a heavy casting supported upon a broad floor base to stand firm.

THE PRINCIPLE involved is the bending by levers from the center outward. The cable chain which operates the bending arms or levers is fastened to their outer ends, passing over the sheaves at the top downward to a drum on which the chain is wound.

THE DRUM is driven by a worm wheel and screw. The outer end of the screw shaft is fitted with a double friction clutch, driven by two 5″ belts in opposite directions for the up and down movements of the bender arms. A convenient hand lever is used for throwing the frictions in or out for starting and stopping the machine.

THE BENDER FORM over which the material is bent is usually made of iron but can be made of wood if desired. It remains on the machine. After the stock is bent up to the form a shackle is used to connect the bent stock at the upper ends, which is attached to the heel castings on the strap, requiring a strap and shackle for each batch of timber bent, which are removed from the machine together and left in the strap until the batch of timber is sufficiently set so as not to spring when the strap and shackle are removed.

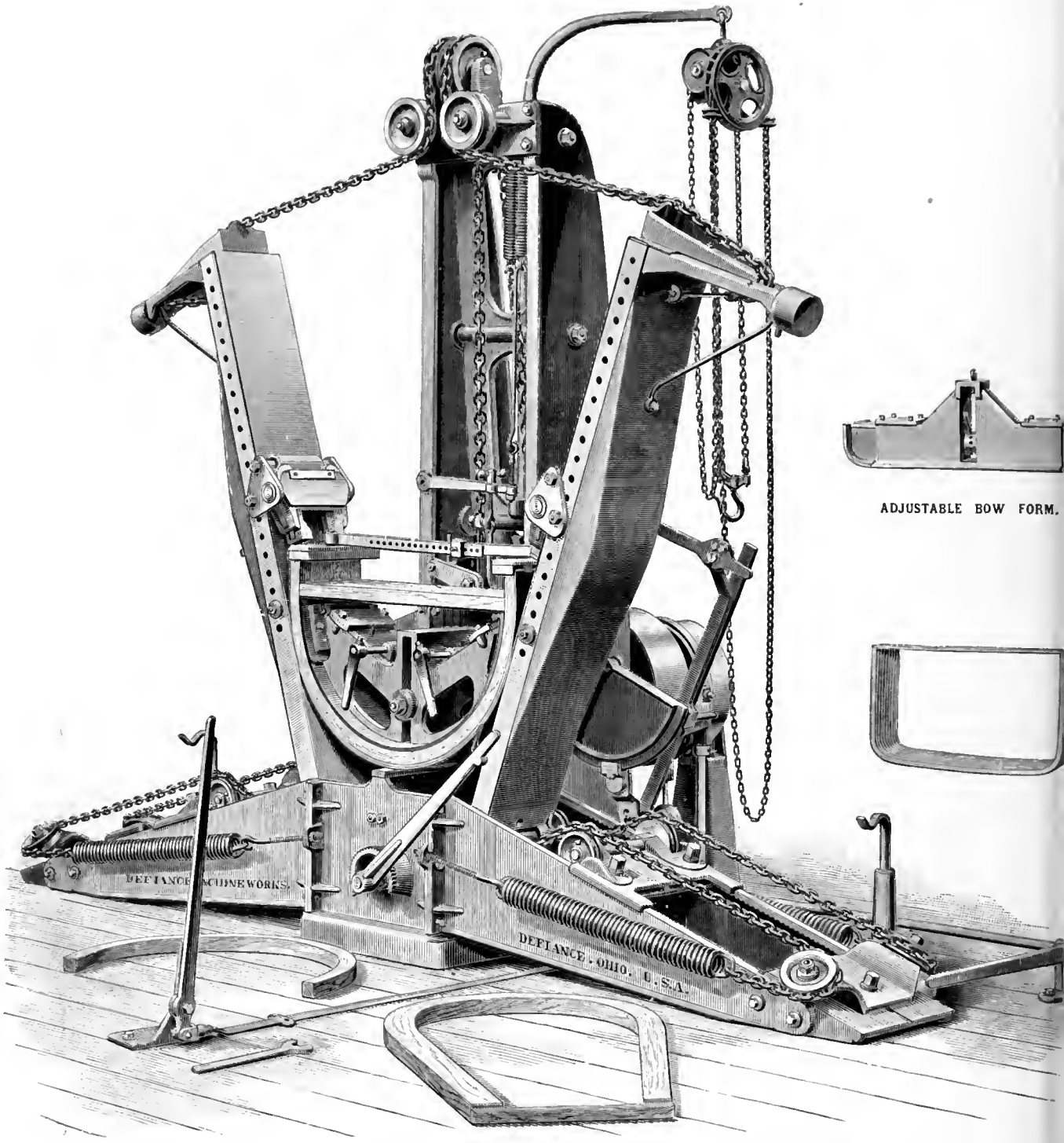
THE BENDING ARMS or levers are very strong. Their inner ends are supported upon fulcrum pins projecting from the lower ends of two links pivoted to the front of the main frame. The entire upper surfaces of the arms are covered with a steel master strap. When the arms are down they form a level table upon which the bending strap is laid to receive the straight timber to be bent. Each end of the strap is fitted with a heel casting which rests against the eccentric head blocks fitted to each of the bender arms.

THE MATERIAL TO BE BENT should be equalized to exact lengths and placed between the heel castings on the strap. The hand wheel above the form is used for quickly bringing the form down firmly upon the material at the point of commencing to bend, and, as the arms are lifted and approach the completion of the bend, an automatic releasing attachment operates the eccentrics on the head blocks to prevent fracturing or buckling the timber.

THE AUTOMATIC RELEASING ATTACHMENT is positive proof against buckling or breaking the stock, and it is the first successful arrangement offered for automatically accomplishing this result.

THE FRICTION COUNTER starts or stops the machine instantly without jar or noise, the operator having instant control over the machine from the working side. The friction pulleys are 24″ × 6″ face for running the arms up and should run 200 turns, and the friction pulley for backing down is 18″ diameter, 5″ face, and should run 400 turns per minute.

HORSE POWER to drive, 1; floor space occupied, 60″ × 162″ × 98″ high.



ADJUSTABLE BOW FORM.

12″ Patent Automatic Felloe, Hound and Bow Bending Machine.

Export Shipping Weight, 9,000 Pounds.
Net Weight, 7,300 Pounds.
Cubic Measurement, 259 Feet.
Cable Word, BOLIVIA.

12″ Patent Automatic Felloe, Hound and Bow Bending Machine.

Export Shipping Weight, 9,000 Pounds.

Net Weight, 7,300 Pounds.

Cubic Measurement, 259 Feet.

Cable Word, BOLIVIA.

THIS ENGRAVING represents our 12″ Patent Automatic Wood Bending Machine, which has been designed to meet all the requirements for the successful and economical bending of felloes for automobile, carriage, and wagon wheels, wagon hounds, carriage bows, reaches, and other similar classes of bent wood stock.

IT IS CAPABLE of bending the lightest felloes used for carriage wheels, up to the heaviest work required for farm wagon, truck, and artillery wheels, bending hard wood as large as 5″ in thickness, 12″ in width with adjustments sufficient to accommodate changes from 16″ to 72″ circles; also wagon hounds to any circle required, and automobile and carriage bows from 36″ up to the largest sizes. The forms for this work are adjustable.

THE FRAME is a massive casting, and is substantial in all its parts. A foundation of masonry is not required under the machine, as an average floor well supported is sufficient.

IT EMBODIES an entirely new feature in the application of power, the object being a drastic longitudinal stress upon the timber to be bent. This is secured by means of an elastic cable railway held taut by four powerful springs which are capable of exerting an aggregate energy of six thousand pounds. Upon this railway roll the trucks by which are carried the inner or lower ends of the levers, or bending arms, long experience in the art of bending timber proving this action to be necessary to secure a shape in satisfactory agreement with the form upon which the timber is bent.

THE LEVERS OR BENDING ARMS form a level table when down, and are covered with a master strap to receive the straight material. They are of cast iron, made hollow and strongly reinforced. They are planed true on the upper surfaces and otherwise fitted up with extreme care. The head blocks mounted upon their upper surfaces are furnished with an automatic eccentric releasing device to release the augmenting end thrust which occurs during the process of bending. This is an office that cannot be properly performed by any other than automatic means; the cable chain which operates the bending arms or levers being fastened to their outer ends, passing over the sheaves at the top of the frame downward to a drum on which the chain is wound.

THE CHAIN DRUM is driven by a powerful worm screw and gear. To the outer end of the screw shaft two frictional clutch pulleys are fitted, one used for running the bending arms up, and it is driven with a 6″ belt, the other with a 5″ belt for backing the arms down, and they should revolve in opposite directions. The vertical lever shown is used to control the frictions and start, stop, or back down the bender arms.

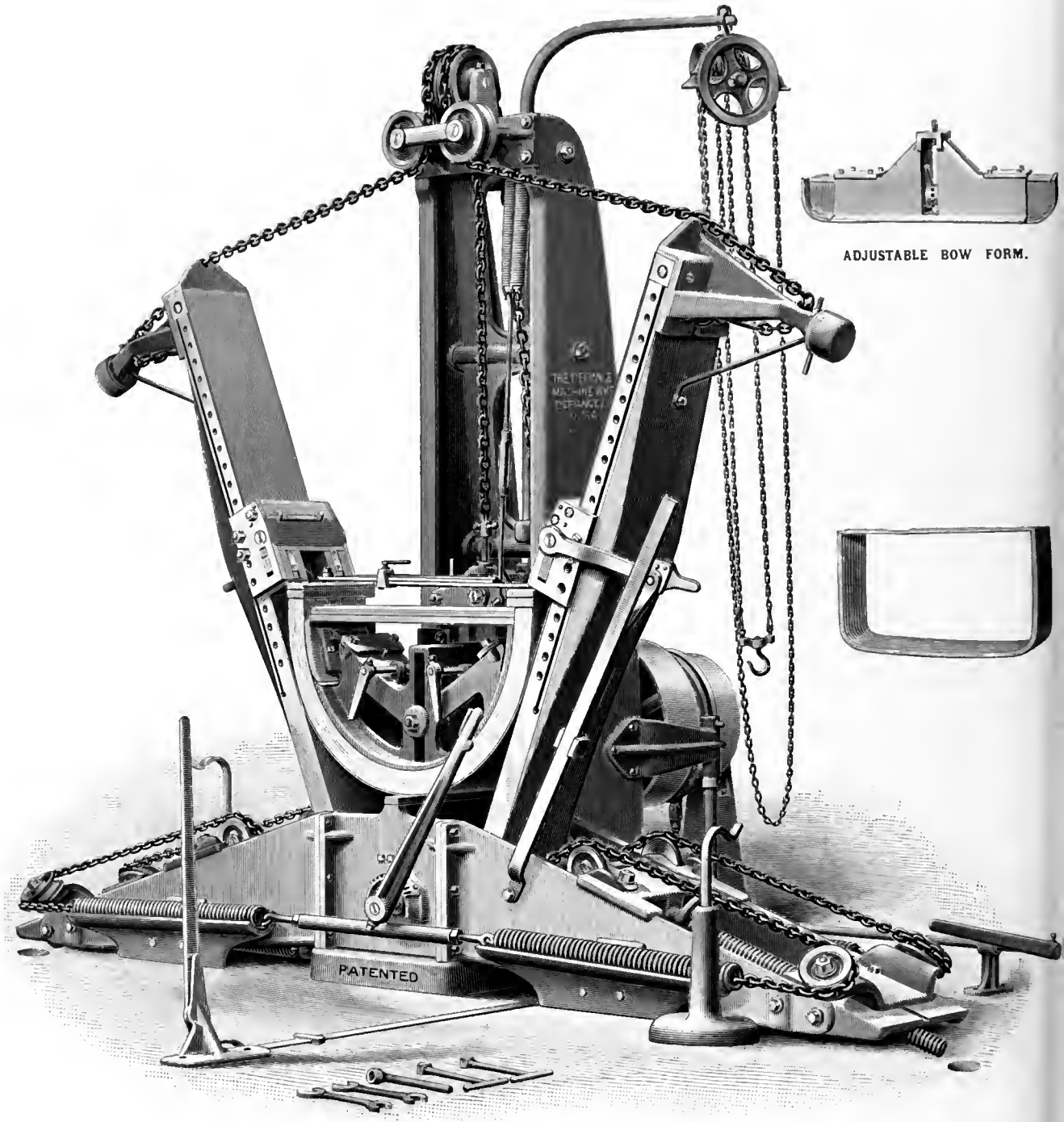
THE FORMS for the bending of felloes are of cast iron, turned true, and with a collapsible section at each end of the arc to secure the easy removal of the stock after bending, and enabling the use of stock about 9″ shorter than can be bent with an ordinary form, which effects a large saving in material. A wooden cap is used on top of the form, which is of the same length as the diameter of the form, and is always taken off with the bent wood, requiring one cap for each batch of timber bent, and it must be left in until the batch of timber is cold and thoroughly set, so as not to spring when the shackle is taken off. The forms are held on a sliding head stock, having a vertical movement, by means of which the timber can be firmly held at the initial point of bending, thus securing it against fracture on the outer arc, and preventing it from retreating from the form at that point. After the operation of bending is completed the machine can be set to run down to the position for the succeeding operation and automatically arrested.

A SWINGING CRANE with hoist attached is furnished with each machine, which enables the operator to easily place the forms in or out of the machine, and when not in use is swung out of the way.

THE CAPACITY OF THIS MACHINE is sufficient to bend about 2,500 felloes 1½″, or about 1,200 wagon hounds in ten hours, and other classes of work in proportion. Timber to the amount of 12″ in width, either in one piece or pieces aggregating that amount, can be bent at one operation.

THE FRICTION PULLEYS are as follows: One for running the arms up, 24″×6″ face; pulley for running down, 18″×5″ face. Speed of pulleys, 200 to 250 turns a minute. Where heavy timber predominates the lower rate of speed is used.

HORSE POWER to drive, 1; floor space occupied, 172″×72″×107″ high.



ADJUSTABLE BOW FORM.

No. 50 Extra Heavy Felloe, Hound and Bow Bending Machine.

Export Shipping Weight, 9,600 Pounds.
Net Weight, 7,900 Pounds.
Cubic Measurement, 259 Feet.
Cable Word, BISON.

No. 50 Extra Heavy Felloe, Hound and Bow Bending Machine.

Export Shipping Weight, 9,600 Pounds.

Net Weight, 7,900 Pounds.

Cubic Measurement, 259 Feet.

Cable Word, BISON.

THIS ENGRAVING represents our No. 50 Extra Heavy Wood Bending Machine, which is the heaviest and most powerful machine ever constructed for the successful and economical bending of felloes for wagon, carriage, automobile and artillery wheels, wagon hounds, bows, reaches and other classes of bent wood stock.

IT WILL accurately bend hard wood without fracturing from a 13½' up to a 72" circle, in different thicknesses up to 6" and in widths up to 12" either in one piece or pieces aggregating that amount, and it will bend automobile, wagon and carriage bows from 36" up to 44" wide with a single adjustable bending form as shown by the engraving. A greater range in widths can be secured by the use of other sized forms.

IT IS heavy and massive throughout. The main frame and bending arms and all its parts are exceedingly strong to overcome springing or jarring when doing its heaviest work.

ENTIRELY NEW FEATURES are embodied in its construction in the application of power. A drastic longitudinal stress upon the timber to be bent is secured by means of an elastic cable railway held taut by powerful coil springs. Upon this railway roll the trucks by which are carried the inner or lower ends of the bending arms. Long experience in the art of bending timber proves this action to be necessary to secure a satisfactory agreement with the form upon which the timber is bent.

THE BENDING ARMS form a level table when down, and they are covered with a steel master strap to receive the straight material. They are cast hollow and strongly reinforced and they are planed true on the upper surface and edges. Each arm is equipped with a novel device at the outward end to quickly take up any stretch in the master strap due to continued use. This strap should at all times be straight and free from buckle in order to accomplish accurate bending. Previous to this new invention a new master strap was necessary when stretching or buckling occurred.

THE HEAD BLOCKS of steel are entirely new. They are very strong and provided with one piece steel eccentrics 2½" diameter. They are operated automatically, requiring no attention on the part of the operator in securing the proper end pressure to the timber while bending, making it impossible to buckle or break the timber.

THE SADDLES, located under the bending arms carrying the sheaves for supporting the chain, are made flexible by the use of heavy springs, and they are each connected by a heavy screw 2¼" diameter × 44" long and provided with ratchet levers for their quick adjustment for small or large diameters of bending. By this new automatic flexible device it is impossible to force the ends of the bender arms against the saddles with sufficient force to injure the machine in any way should a mal-adjustment of the saddles occur.

THE CHAIN DRUM is driven by a powerful worm screw and gear. To the outer end of the screw shaft two frictional clutch pulleys are fitted, one used for running the bending arms up, and it is driven with a 6" belt, the other with a 5" belt for backing the arms down, and they should revolve in opposite directions. The vertical lever shown is used to control the frictions, and start, stop, or back down the bender arms.

THE PATENT IRON BENDING FORMS are turned true to the size of the inner circle of the timber to be bent, and they are provided with collapsible sections at each end of the arc, which can be instantly moved in by convenient levers to secure the easy removal of the stock after bending and quickly moved out and automatically locked in position ready for the next batch of timber to be bent. By the use of these collapsing forms stock 9" shorter can be used and properly bent over the use of the solid one piece form, as a much thinner cap can be used on top of the form. Thus a saving of 9" in each piece of timber bent is effected. The bending form is held in a sliding head stock, having a vertical movement by hand lever to bring it down, and firmly held at the initial point of bending, thus securing it against fracture on the outer arc and preventing it from retreating from the form at that point. After the operation of bending is completed the machine can be set to run down to the position for the succeeding operation and automatically arrested.

THE SWINGING CRANE with hoist attached enables the operator to easily place the bending forms in or out of the machine, and when not in use is swung out of the way.

ITS CAPACITY is sufficient to bend 500 forms of medium sized stock in ten hours and heavy pieces in proportion without loss if properly steamed.

THE FRICTION PULLEYS for driving the machine are as follows: One for running the arms up, 24" × 6"; one for running the arms down, 18" × 5" face; speed, 300 turns per minute.

HORSE POWER to drive, 2; floor space occupied, 172" × 72" × 107" high.

Patent 9″ Single Arm Wood Bending Machine.

Export Shipping Weight, 4,300 Pounds.
Net Weight, 3,300 Pounds.
Cubic Measurement, 185 Feet.
Cable Word, BOSTONIAN.

Patent 9″ Single Arm Wood Bending Machine.

Export Shipping Weight, 4,300 Pounds.

Net Weight, 3,300 Pounds.

Cubic Measurement, 185 Feet.

Cable Word, BOSTONIAN.

THIS ENGRAVING represents our Patent 9″ Single Arm Wood Bending Machine, designed for bending wood for various purposes, such as sled runners, hames, hockey sticks, shafts, poles, chair backs, etc. The principle involved is the bending by a single arm from the end of the material outward around a form, the shape of which governs the shape of the bending. It will successfully bend hard wood from the lightest sizes up to 6″ thick by 9″ wide, either in one piece, or pieces aggregating that width can be bent at one time, and it will bend stock up to 8¼ feet long and anything shorter.

THE CABLE CHAIN which operates the bending arm is fastened to its outer end, passing over sheaves at the top of the machine, thence downward to a drum on which the chain is wound. The drum is driven by a worm wheel and screw propelled by a powerful double friction clutch driven by two 5″ belts in opposite directions for the up and down movements of the bending arm. A convenient hand lever is used to instantly engage or disengage the frictions for starting or stopping the machine.

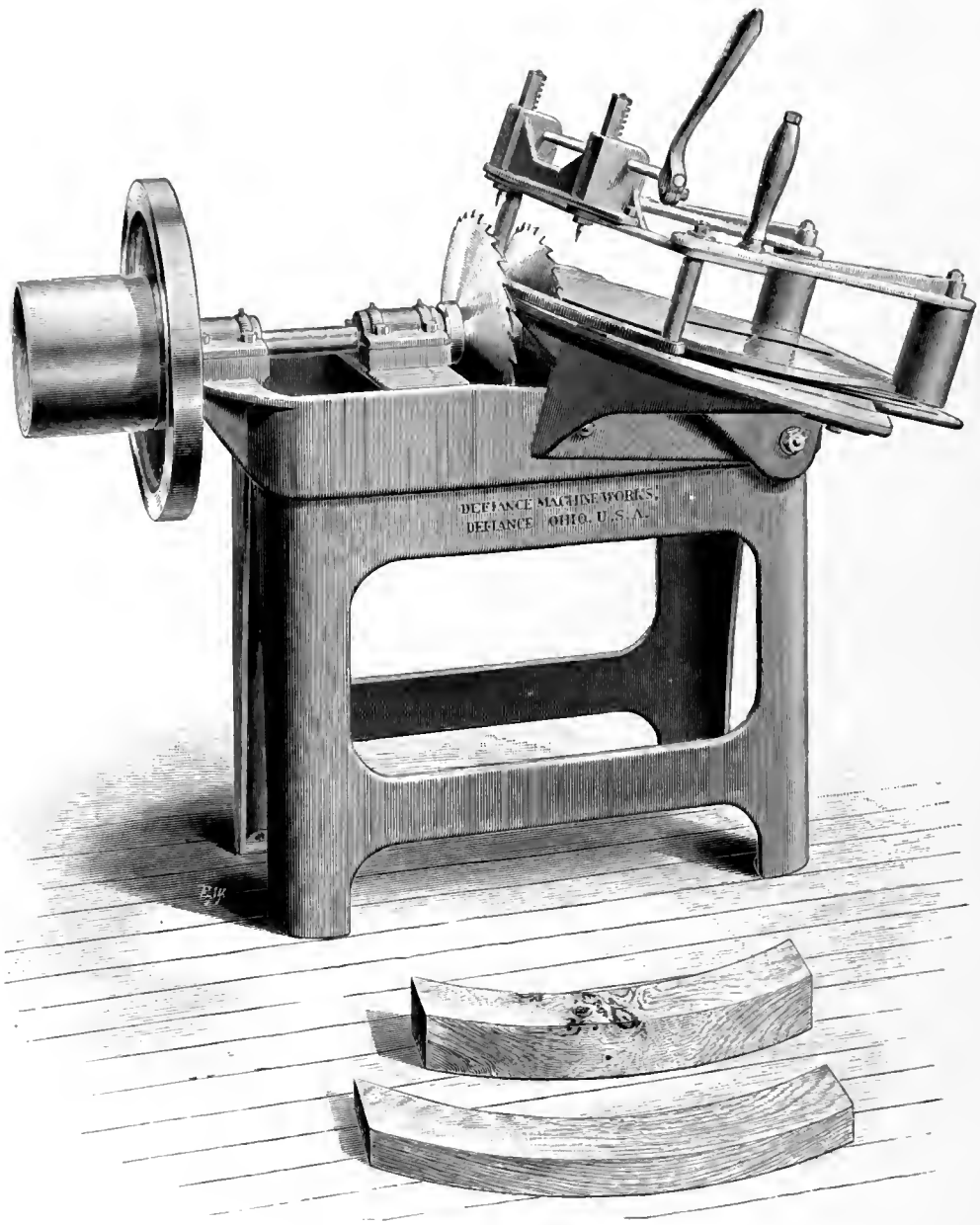
THE IRON FORM over which the material is bent should correspond in shape to the circle of the bending and it is provided with a vertical adjustment by hand wheel and screw to force the work to be bent down tightly against the table before commencing to bend, and to release the stock from the table after the bending is completed.

THE BENDING ARM is covered on its upper surface with a steel master strap which remains on the machine, and when the arm is down forms a level table upon which the bending strap, with the material to be bent, is placed. An ingenious patent automatic compressing and releasing device is fitted to the bending arm, which, before commencing to bend, is brought up tightly against the end of the wood by the hand lever shown, which is attached to an eccentric and sliding head block, forcing the wood against the casting on the small stationary table; the bending is then performed, after which the shackle is attached to each end of the casting on the bender strap, and, when the bending arm is lowered, the bent stock with the strap and shackle is removed from the machine, and the stock allowed to remain in the strap for several hours. A strap and shackle are required for each batch of timber bent.

THE FRAME of this machine is of iron and steel throughout. It is very heavy and stiff, to withstand the heavy labor expected of it, and it is provided with a broad base to stand firm.

THE FRICTION COUNTER is a part of the machine. The friction pulley for running the arm up is 24″ × 6″ face, and should run 200 turns per minute, and the friction pulley for backing down is 18″ diameter, 5″ face, and should run 400 turns per minute.

HORSE POWER to drive, 1; floor space occupied, 60″ × 117″ × 140″ high.



No. 1 Improved Concave Felloe Sawing Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,070 Pounds.

Cubic Measurement, 74 Feet.

Cable Word, STOCKHOLM.

No. 1 Improved Concave Felloe Sawing Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,070 Pounds.
Cubic Measurement, 74 Feet.
Cable Word, STOCKHOLM.

AN IMPROVED MACHINE for cutting wagon felloes we herewith illustrate by the accompanying engraving. It is well and favorably known to wagon builders and wheel makers as a standard machine for this class of work.

THE FRAME is of cast iron, cored style, and it is properly braced to withstand heavy labor.

THE ARBOR is made of hammered steel $1\frac{7}{16}''$ diameter, running in genuine babbitt metal self-lubricating bearings. It is fitted at saw end with adjustable collars of different thicknesses, for regulating the width of felloes to be cut.

THE TABLE upon which the carriage rests is nicely fitted to the frame, having vertical and tilting adjustments, and it can be set at the desired angle to suit the dish of the saws.

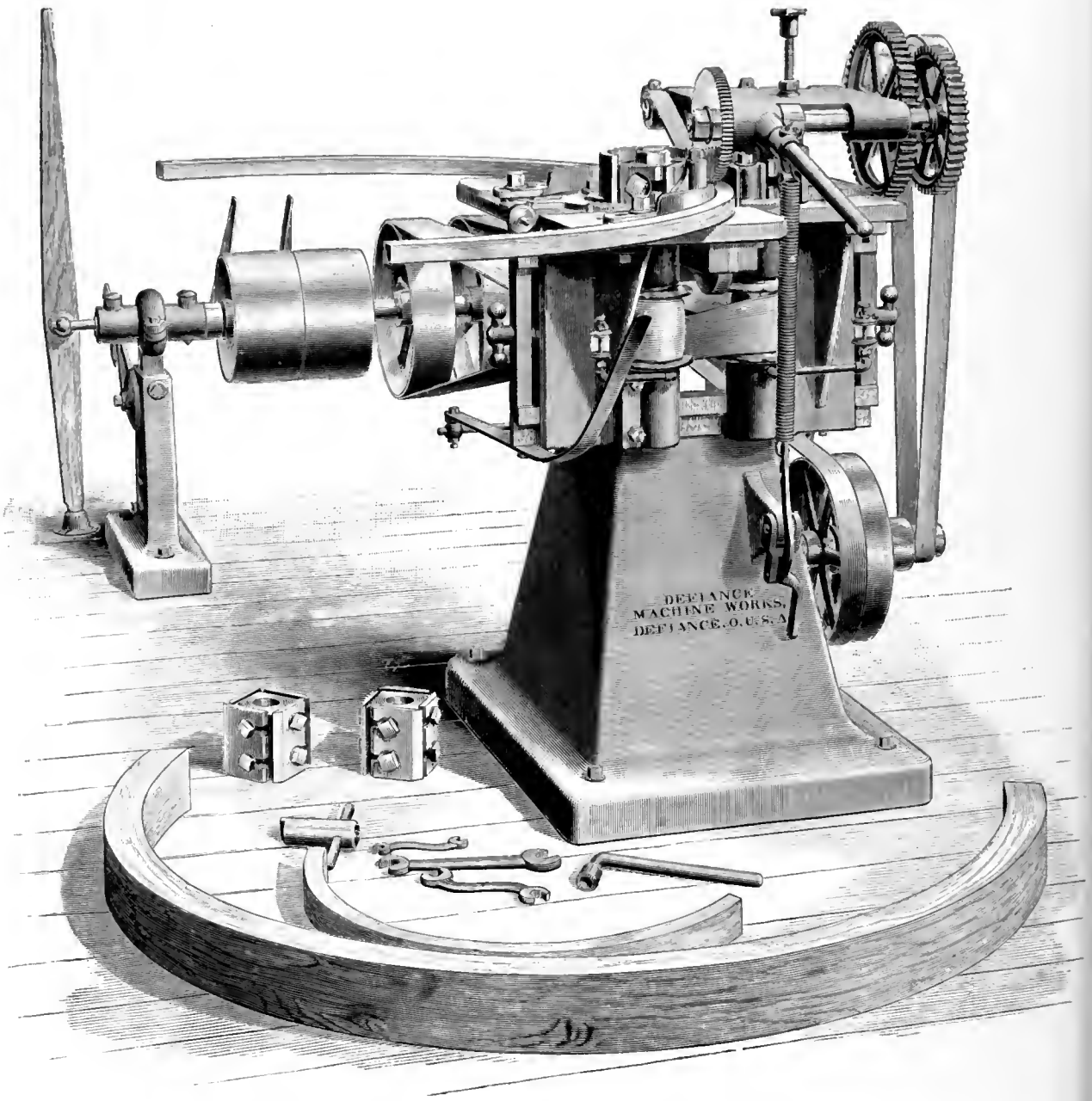
THE SLIDING CARRIAGE is connected to the table by a center pin which is movable in a slot. The position of the center pin governs the circle in which the carriage travels, and it can be quickly changed to cut felloes from one diameter to another.

IN OPERATING, material of proper length and thickness to form the width of felloe required is placed upon the sliding carriage and held firmly in position by a pair of steel dogs, each operating simultaneously by hand lever. Each movement of the carriage produces a felloe, cutting smooth and true, effecting an immense saving in time over band sawed felloes, as the marking out of the work is entirely avoided and both sides of the work are cut at one time.

THESE MACHINES are furnished with saws for 3 foot 8″ and 4 foot 6″ wheels, or other sizes if desired, and are adapted to the cutting of felloes from 4″ wide and under.

THE COUNTERSHAFT is $1\frac{15}{16}'' \times 48''$; two No. 2 hangers; one $30'' \times 6''$ driver; two $10'' \times 6''$ tight and loose pulleys; one shipper complete. Speed of counter, 720 rotations per minute; pulley on arbor, $8'' \times 6''$; speed, 2,700 rotations per minute.

HORSE POWER to drive, 5; floor space occupied, $24'' \times 48''$.



No. 1 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 1,600 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 40 Feet.
Cable Word, PONTIAC.

No. 1 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 1,600 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 40 Feet.
Cable Word, PONTIAC.

THIS No. 1 PATENT FELLOE PLANER is used to plane the arc or inside and tread of felloes, such as are used on automobile, wagon, and carriage wheels, preparing them for the boring and rounding machines; it is calculated to plane from 18″ up to the largest circles, and from the lightest to 4″ wide by 2¾″ thick. It is a companion machine to our No. 2 Felloe Planer, and should be handled by the same operator.

IT IS constructed upon a neat iron frame, cast in one piece with cored center, making it strong and substantial. It is provided with two vertical cutter heads fitted to heavy steel spindles, the bearings of which are gibbed to the front of the main frame, and they can be quickly adjusted to plane felloes of various sizes.

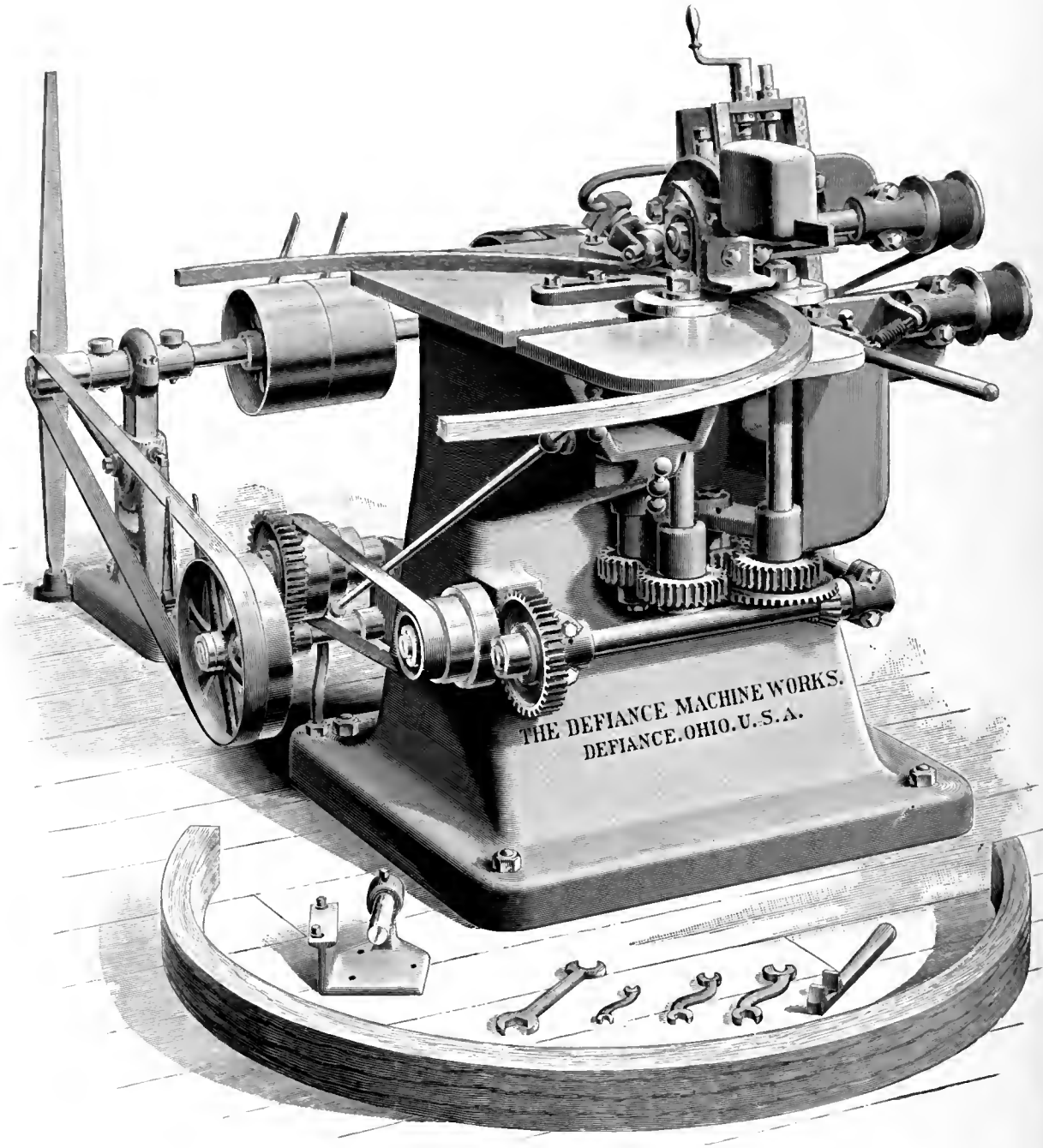
THE CUTTER HEADS stand directly opposite each other with the feeding rolls between them, which enables the machine to dress felloes to an equal thickness when bent to a true or untrue circle; each head is provided with four knives, and they are supplied with improved chip breakers to plane the work smooth; an adjustable shield surrounds the cutters to protect the operator, and to guide the shavings from the machine, or into a blower pipe.

THE FEED is driven by cut gearing and has three changes of speed; can be started or stopped instantly while the machine is in motion, and it is self-adjusting for felloes of various widths; a flexible pressure of the roll upon the work is secured with a coiled spring.

THE CAPACITY of this machine is sufficient to plane from 225 to 250 sets of felloes per day, and do the work first-class without losing a single piece from bad planing.

THE COUNTER is furnished as follows: Shaft, 1 1/16″ × 55″ long; two heavy floor stands with 1 1/16″ ball and socket adjustable boxes; two 14″ × 3″ driving pulleys; tight and loose pulleys, 10″ × 5″; speed, 1,200 rotations per minute; a convenient belt shipper is furnished.

HORSE POWER to drive, 3; floor space occupied, 55″ × 78″.



No. 2 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 2,300 Pounds.
Net Weight, 1,800 Pounds.
Cubic Measurement, 75 Feet.
Cable Word, PITTSBURG.

No. 2 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 2,300 Pounds.
Net Weight, 1,800 Pounds.
Cubic Measurement, 75 Feet.
Cable Word, PITTSBURG.

THIS ENGRAVING represents our Patent No. 2 Felloe Planing Machine, which is used to dress both sides of felloes for vehicle wheels at one time, and reduce them to the proper width; it being a companion machine to our No. 1 Felloe Planer, and should be handled by the same operator.

THIS MACHINE has been designed with great care, with as few and simple adjustments as possible, so that it can be handled successfully by cheap labor. It will plane felloes smooth and true without clipping the ends; it will plane felloes from the smallest up to 2¾″ thick, 4″ wide.

IT IS fitted with two horizontal steel cutter heads, one above and the other below the table, and arranged to plane the sides of felloes parallel or to any desired angle or bevel. By turning a single hand-screw the heads can be adjusted any desired distance apart to plane from the very lightest felloes used for carriage wheels up to the heaviest work used for farm wagon and truck work. By the aid of an index the heads can be set for beveling without the use of a rule.

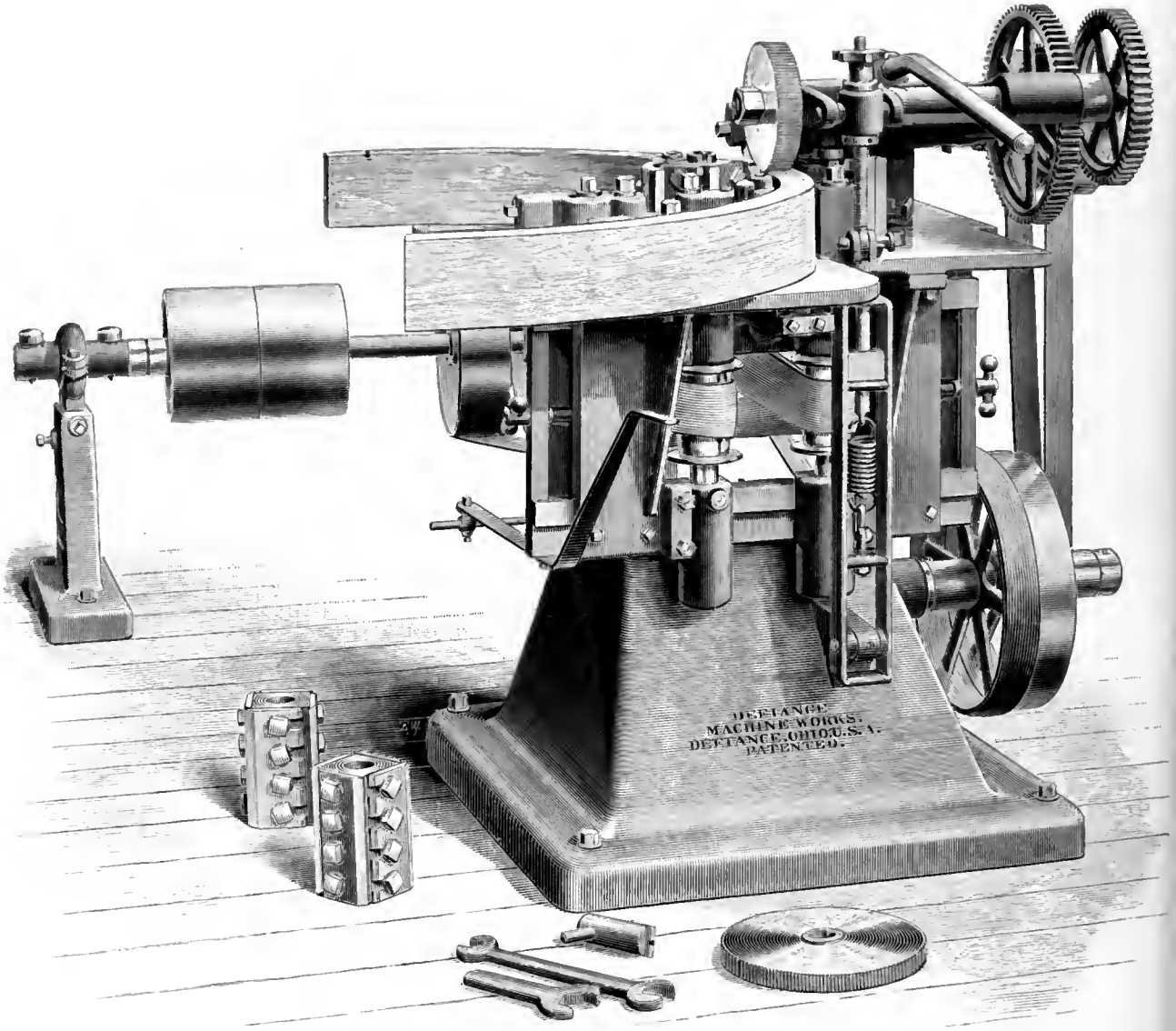
THE TABLE, or bed of the machine, is made to gauge the thickness of cut of the lower head. The upper head is provided before the cut with a weighted chip breaker and bonnet, which can be instantly removed out of the way when access to the cutters is desired.

THE FEED consists of two vertical feed rolls located close up to the cutter heads, with smooth faces to prevent marring the felloe. By the use of the vertical rolls, the felloe is fed into the machine without cramping or binding, and they will accommodate adjustments sufficient to plane from 18″ up to the largest circles. The feed is of the most rapid and positive kind with three changes of speed, and it can be instantly started or stopped by a slight movement of the hand lever.

THE CAPACITY of this machine is sufficient to plane from 225 to 250 sets of felloes per day, and for perfect work and ease of adjustment it cannot be equaled by any other machine in the market.

THE COUNTER is independent of the machine, so that belts of any desirable length can be used; the countershaft is 1⅛″ × 55″ long, with two heavy floor stands with 1⅛″ ball and socket adjustable boxes. The two driving pulleys are 14″ × 3″, and the tight and loose pulleys are 10″ × 5″ and should run 1,200 rotations per minute. A complete belt shipping apparatus is furnished.

HORSE POWER to drive, 3; floor space occupied, 55″ × 94″.



No. 3 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 2,300 Pounds.
Net Weight, 1,800 Pounds.
Cubic Measurement, 62 Feet.
Cable Word, PANAMA.

No. 3 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 2,300 Pounds.

Net Weight, 1,800 Pounds.

Cubic Measurement, 62 Feet.

Cable Word, PANAMA.

THIS ENGRAVING represents our No. 3 Patent Felloe Planing Machine used to plane the arc or inside and tread of felloes such as are used on automobile, carriage, wagon, and truck wheels, preparing them for the boring and rounding machines. It will plane from 18″ up to the largest circles, and from light felloes up to 4″ thick 8″ wide. It has sufficient power and strength to plane the heaviest work with ease and do it perfectly smooth without clipping the end of the felloe. It is a companion machine to our No. 4 Felloe Planer and should be handled by the same operator.

THE FRAME, of neat design, is cast in one piece, with cored center and a broad floor base, making it strong and substantial.

THE CUTTER HEAD SPINDLES, of steel, large in diameter, are arranged side by side, running in long genuine babbitt metal bearings attached to heavy saddles which are gibbed to the front of the main frame and adjustable to or from each other by hand-screws for regulating the thickness of the material to be planed. This adjustment can be made while the machine is in motion.

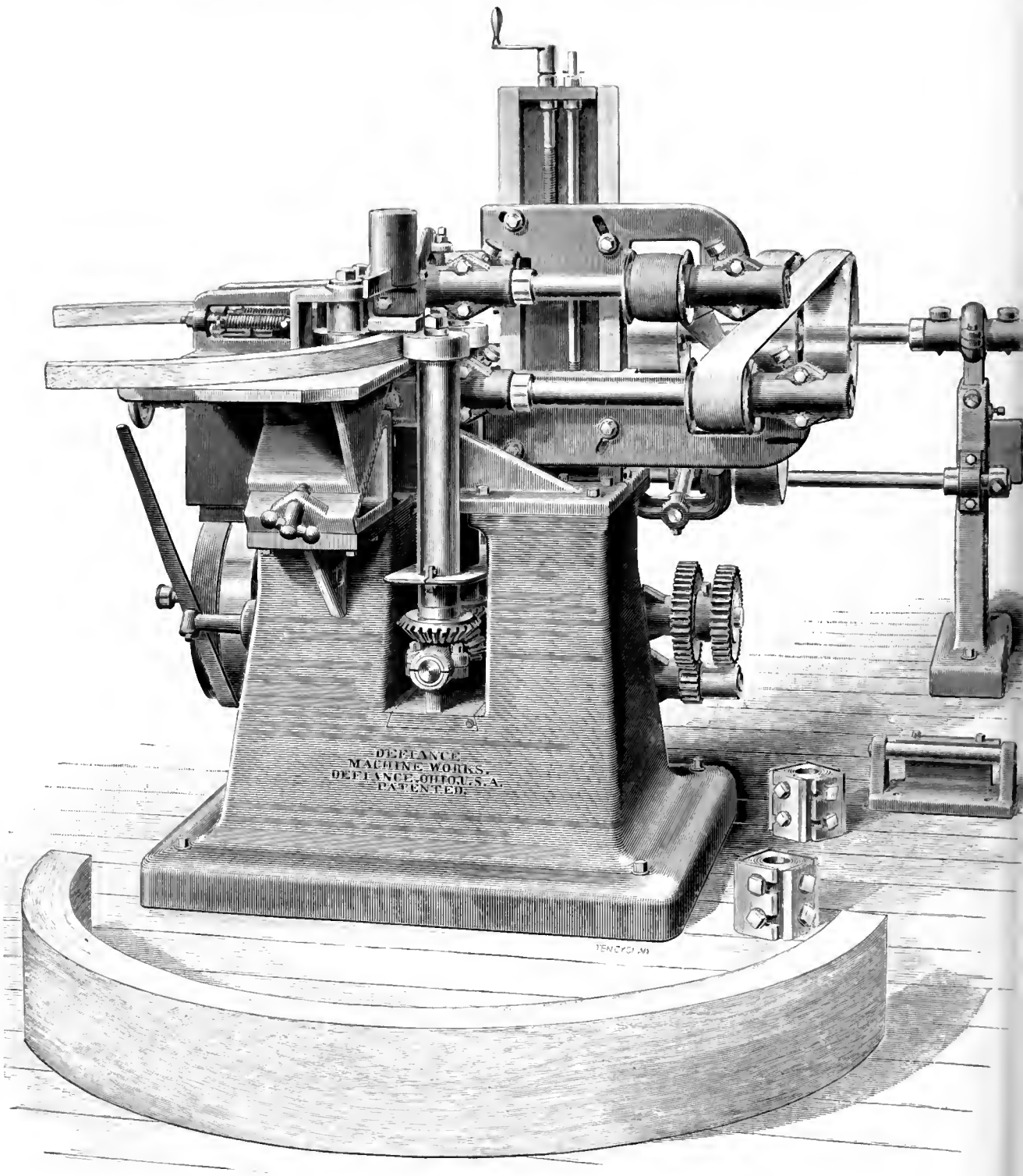
THE CUTTER HEADS stand directly opposite each other with the feeding rolls between them, which enables the machine to dress felloes to an equal thickness when bent to a true or untrue circle. Each cutter head is equipped with four knives and chip breakers, and they will plane the work either in hard or soft wood perfectly smooth. An adjustable shield fitted into a turned recess on top of the table surrounds the cutters to protect the operator, and to guide the shavings from the machine or into a blower pipe. An improved knife setting device is furnished to set the knives accurately before the heads are placed into the machine, which saves a great deal of time and annoyance to the operator.

THE FEED is very powerful and it is driven by cut gearing, having two changes of speed which can be started or stopped instantly while the machine is in motion, and it is self-adjusting for irregular thicknesses of stock. A flexible pressure of the feed roll upon the work is secured with a coil spring. The entire feeding apparatus can be instantly lifted back out of the way when access to the cutters is desired.

THE CAPACITY of this machine is sufficient to plane from 225 to 250 sets of felloes of ordinary size per day, and extremely large ones in proportion, and do the work first-class without losing a single felloe from bad planing.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$″×55″; two ball and socket adjustable floor stands, 16″ high; two 14″×4″ driving pulleys; pulley to drive feed, $2\frac{7}{8}$″×$4\frac{1}{4}$″; tight and loose pulleys, 10″×6″; speed, 1,100 turns per minute.

HORSE POWER to drive, 3; floor space occupied, 55″×85″.



No. 4 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 2,750 Pounds.

Net Weight, 2,150 Pounds.

Cubic Measurement, 78 Feet.

Cable Word, POCHANTOS.

No. 4 Patent Two-Side Felloe Planing Machine.

Export Shipping Weight, 2,750 Pounds.

Net Weight, 2,150 Pounds.

Cubic Measurement, 78 Feet.

Cable Word, POCHANTOS.

THIS ENGRAVING represents our No. 4 Patent Two-Side Felloe Planing Machine, which is used to dress both sides of felloes for vehicle wheels at one operation and reduce them to the required width. It is a companion machine to the No. 3 Felloe Planer, and it should be handled by the same operator.

THIS MACHINE has been designed with the greatest care, with as few and simple adjustments as possible, so that it can be successfully handled by inexpensive labor and produce perfect work. It is calculated to plane from the light felloes up to 4″ thick, 8″ wide, and to any circle, planing the work parallel or beveling, as desired. All the adjustments for different sizes and kinds of work can be made while the machine is in motion.

THE FRAME, of new design, is very neat in appearance. It is cast with cored center and a broad floor base, and it is strong and substantial in every detail.

IT IS fitted with two horizontal cutter heads attached to heavy steel spindles running in long, substantial bearings, one above and the other below the table. The saddles supporting the spindles are gibbed and accurately fitted to the upright, and provided with a vertical adjustment by hand-screws to set the heads up or down for different widths of felloes, and they can be tilted to any desired angle, and, by an index fitted to each saddle, the adjustment can be made exact for any bevel on any size felloe, or instantly set to plane parallel.

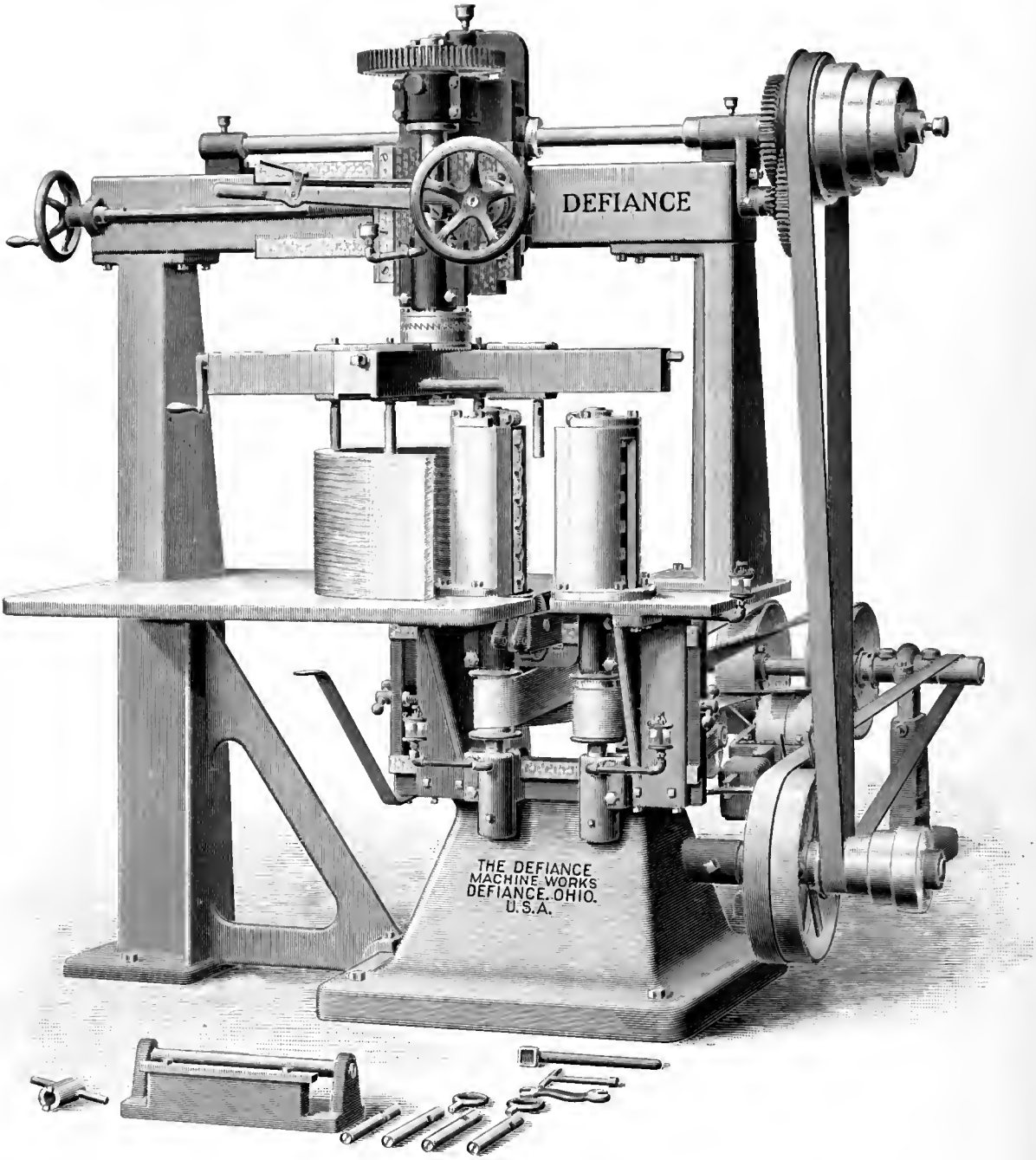
THE TABLE, upon which the material is placed while being planed, is made to gauge the depth of cut for the lower cutter head. The upper head is provided before the cut with a weighted chip breaker and bonnet, which can be instantly lifted up out of the way when access to the cutters is desired.

THE FEED consists of four vertical feed rollers located close up to the cutter heads with smooth faces to prevent marring the felloe. By the use of vertical rolls, the felloe is fed into the machine without cramping or binding, whereby true and accurate work can be accomplished. The feed is driven by cut gearing, and it is very steady and powerful with two changes of speed. It can be instantly started or stopped while the machine is in motion.

THE CAPACITY of this machine is sufficient to plane from 225 to 250 sets of felloes of ordinary size per day, and extremely large ones in proportion. For ease in adjustment and perfect work it has no equal.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}'' \times 55''$; two floor stands 28″ high, fitted with special belt tightener; two $14'' \times 3\frac{1}{2}''$ driving pulleys; pulley to drive feed, $3\frac{1}{8}'' \times 4\frac{1}{2}''$; tight and loose pulleys, $10'' \times 5''$; speed, 1,100 turns per minute.

HORSE POWER to drive, 3; floor space occupied, $55'' \times 90''$.



No. 5 Heavy Two-Side Auto-Truck Felloe Planing Machine.

Export Shipping Weight, 4,200 Pounds.

Net Weight, 3,400 Pounds.

Cubic Measurement, 143 Feet.

Cable Word, PARROT.

No. 5 Heavy Two-Side Auto-Truck Felloe Planing Machine.

Export Shipping Weight, 4,200 Pounds.
Net Weight, 3,400 Pounds.
Cubic Measurement, 143 Feet.
Cable Word, PARROT.

THIS ENGRAVING represents our No. 5 Heavy Two-Side Auto-Truck Felloe Planing Machine, which is used to plane the arc, or inside and tread, of rims such as are used for automobile truck wheels and other wheels where wide treads are required. It will plane rims from a 17″ to a 36″ circle and from 8″ to 13″ in width by 1″ to 6″ thickness. It has sufficient strength and power to plane these heavy rims with ease and will perform its work perfectly smooth without clipping the ends.

THE FRAME, of neat design, is cast in one piece, with cored center and a broad base, making it strong and substantial.

THE CUTTERHEAD SPINDLES, of steel, large in diameter, are arranged side by side, running in genuine babbitt metal bearings attached to heavy saddles which are gibbed to the front of the main frame and are adjustable to and from each other, by hand screw, for regulating the thickness of the material to be planed. This adjustment can be made while the machine is in motion. These spindles are also fitted with a special top bearing of bronze, which insures rigidity and strength.

THE CUTTERHEADS stand directly opposite each other with a special feeding device which operates between them, thus enabling the machine to dress rims to an equal thickness whether bent to a true or untrue circle. Each cutterhead is equipped with four knives and chip breakers and they will plane the hardest wood perfectly smooth. An adjustable shield fitted into a turned recess on the top of the table surrounds the cutters to protect the operator and to guide the shavings from the machine into a blower pipe. An improved knife setting device is furnished to set the knives accurately before the heads are placed in the machine.

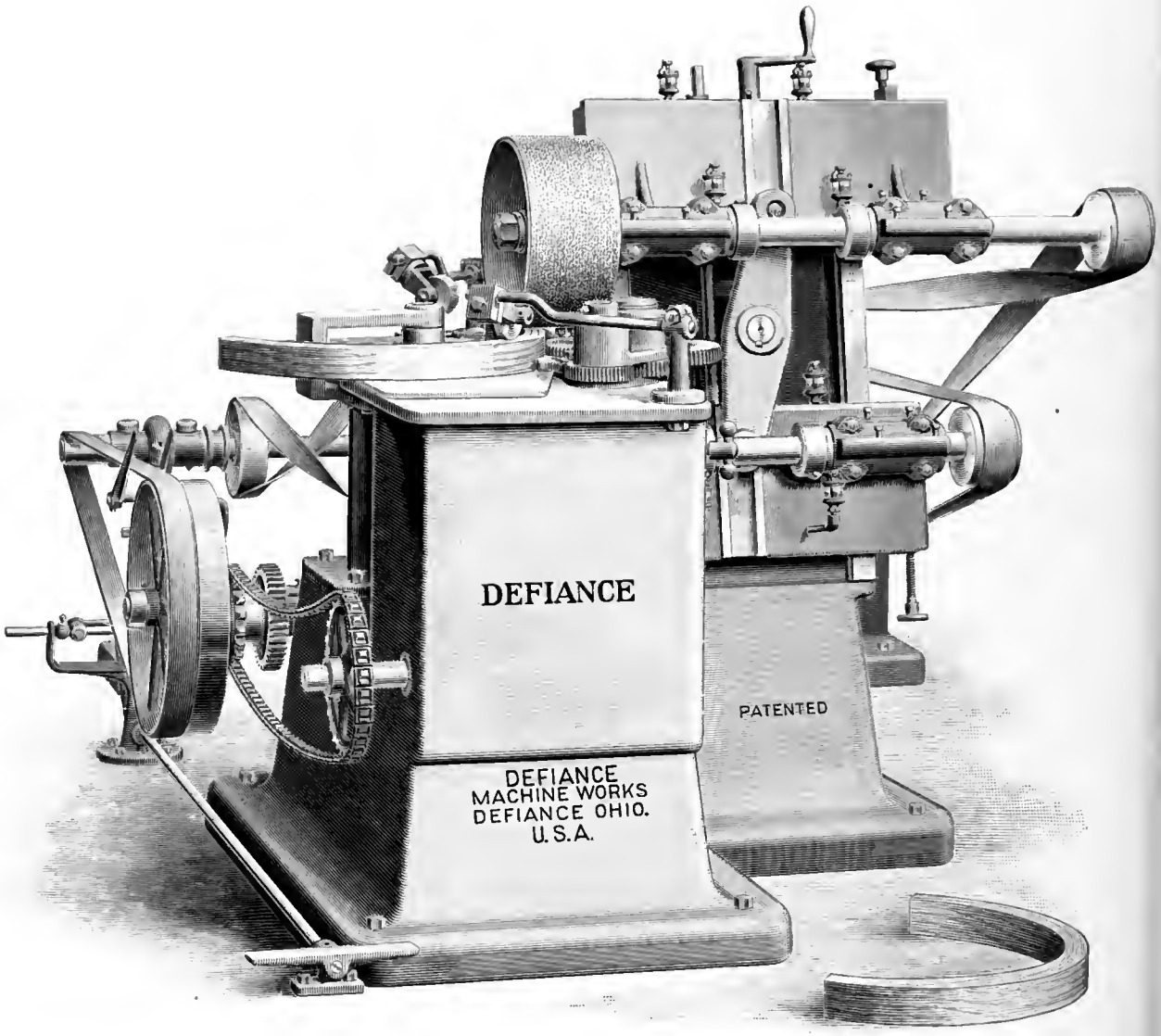
THE FEED is very powerful and is driven by cut gearing, having two changes of speed, which can be started or stopped instantly, while the machine is in motion, and it is self-adjusting for irregular thicknesses of stock.

THE CAPACITY of this machine is sufficient to plane from 50 to 100 sets of rims per day and do the work in a first-class manner without the loss of a single rim from bad planing.

THE COUNTER is furnished as follows: Shaft, 1 1/16″ × 56″; two No. 2 ball and socket adjustable floor stands 20″ high; two 14″ × 4½″ driving pulleys; pulley to drive feed, 2⅞″ × 4¼″; tight and loose pulleys, 10″ × 6″; speed, 1,000 revolutions per minute.

TWO SPECIAL IDLERS are furnished to support the under side of the belts that drive the cutterhead spindles.

HORSE POWER to drive, 8; floor space occupied, 74″ × 96″.



No. 0 Patent Double Drum Felloe Polishing Machine.

Export Shipping Weight, 4,100 Pounds.

Net Weight, 3,400 Pounds.

Cubic Measurement, 125 Feet.

Cable Word, POTOMAC.

No. 0 Patent Double Drum Felloe Polishing Machine.

Export Shipping Weight, 4,100 Pounds.
Net Weight, 3,400 Pounds.
Cubic Measurement, 125 Feet.
Cable Word, POTOMAC.

THIS MACHINE has been designed for polishing at one operation both sides of felloes used on automobile, artillery, carriage, wagon and truck wheels. It polishes lengthwise with the grain of the material, thus securing a perfectly smooth and uniform surface, entirely avoiding hand finishing, and it produces the work by cheap labor at an immense saving over any other method. It will successfully handle felloes from 14″ diameter up to the largest circles in various thicknesses and widths, and work of the same thickness but to different circles can be fed through the machine without any adjustment of the feed rolls. This method of polishing the sides of the felloe, before the inner circle is rounded, eliminates the possibility of leaving a line or mark where the rounded and flat surfaces meet, as the polishing belt for finishing the rounded portion blends out the finish so that no mark is visible.

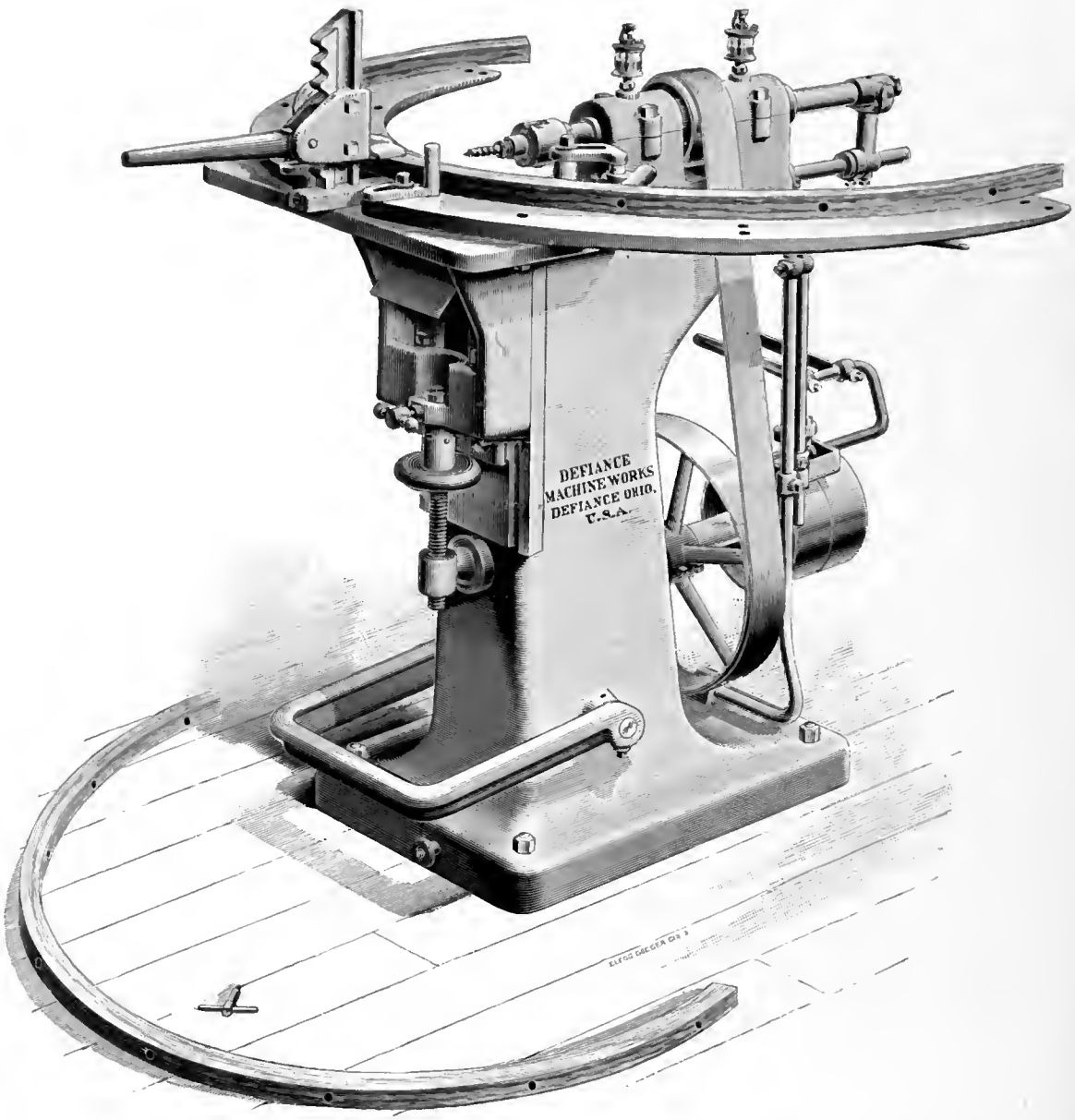
THE WORKING PARTS are mounted upon and accurately fitted to a massive iron frame, cast in one piece, with cored center and a wide floor base to stand firm to keep the parts in perfect alignment and to avoid jar or vibration when in motion.

THE POLISHING DRUMS are 12″ diameter, 6″ face, and they are covered with heavy cloth bands, forming a cushion, over which the sandpaper is stretched and held in position by taper keys, which are very simple to adjust in placing on or taking off the paper. The drum spindles of ground steel, large in diameter, rotate in dust-proof, self-lubricating bearings. The saddles which support the drum spindles can be quickly adjusted vertically by hand lever for felloes of different widths, and they are also provided with an adjustment to bring the spindles parallel with each other, or tilted to any angle, to polish felloes with parallel or beveling sides. When rotating, the drums are oscillated across the work in order to utilize the full width of the sandpaper, thus securing a large polishing surface, but more particularly to secure a true and smooth surface, as the combined rotating and oscillating movements prevent the slightest scratch and remove all fuzz, producing a hard, clean finish.

THE VERTICAL FEED ROLLS are powerfully geared and they have several changes of speed to suit light and heavy work, their flexibility being so great that a 14″ circle felloe can be fed through followed by a straight stick without any adjustment of the rolls except that which is furnished automatically.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}$″ × 74″ long; two No. 2 floor stands; two driving pulleys, 24″ × 5″; feed pulley, 2½″ × 4″; driving pulley for oscillation, 8″ × 2″; tight and loose pulleys, 10″ × 6″; speed, 425 rotations per minute. The loose pulley is fitted with bronze bearings and is self-lubricating.

HORSE POWER to drive, 3; floor space occupied, 74″ × 96″.



No. 1 Patent Rim and Felloe Boring Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 29 Feet.

Cable Word, BEARING.

No. 1 Patent Rim and Felloe Boring Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 29 Feet.

Cable Word, BEARING.

THIS MACHINE, as shown by the accompanying engraving, is used by wheel and wagon makers to bore the tenon holes in the wheel's rim or felloe, for the reception of the spokes.

IT WILL bore holes up to 2½″ diameter, 7″ deep at the largest. The circular table upon which the material to be bored is placed can be quickly adjusted to suit any circle from 18″ to 84″ diameter, and it can be reversed to bore either from the inside or outside of the rim.

A SELF-SPACING ATTACHMENT is furnished to space automatically the distance between the spoke holes without marking off, thus effecting a great saving in time over the old method and enabling the operator to bore all the holes an equal distance apart.

IT IS supplied with an improved cutter head fitted to the boring spindle to face off a circular spot around the tenon hole on the inner side of the rim, to form a perfect bearing for the shoulder of the tenon against the rim. This operation is performed at the same time the boring is accomplished, without any additional expense, an extremely desirable feature, and one that will be appreciated by practical wheel makers.

THE FRAME, of neat design, is cast in one piece with cored center and of sufficient weight to stand firm even without fastening to the floor.

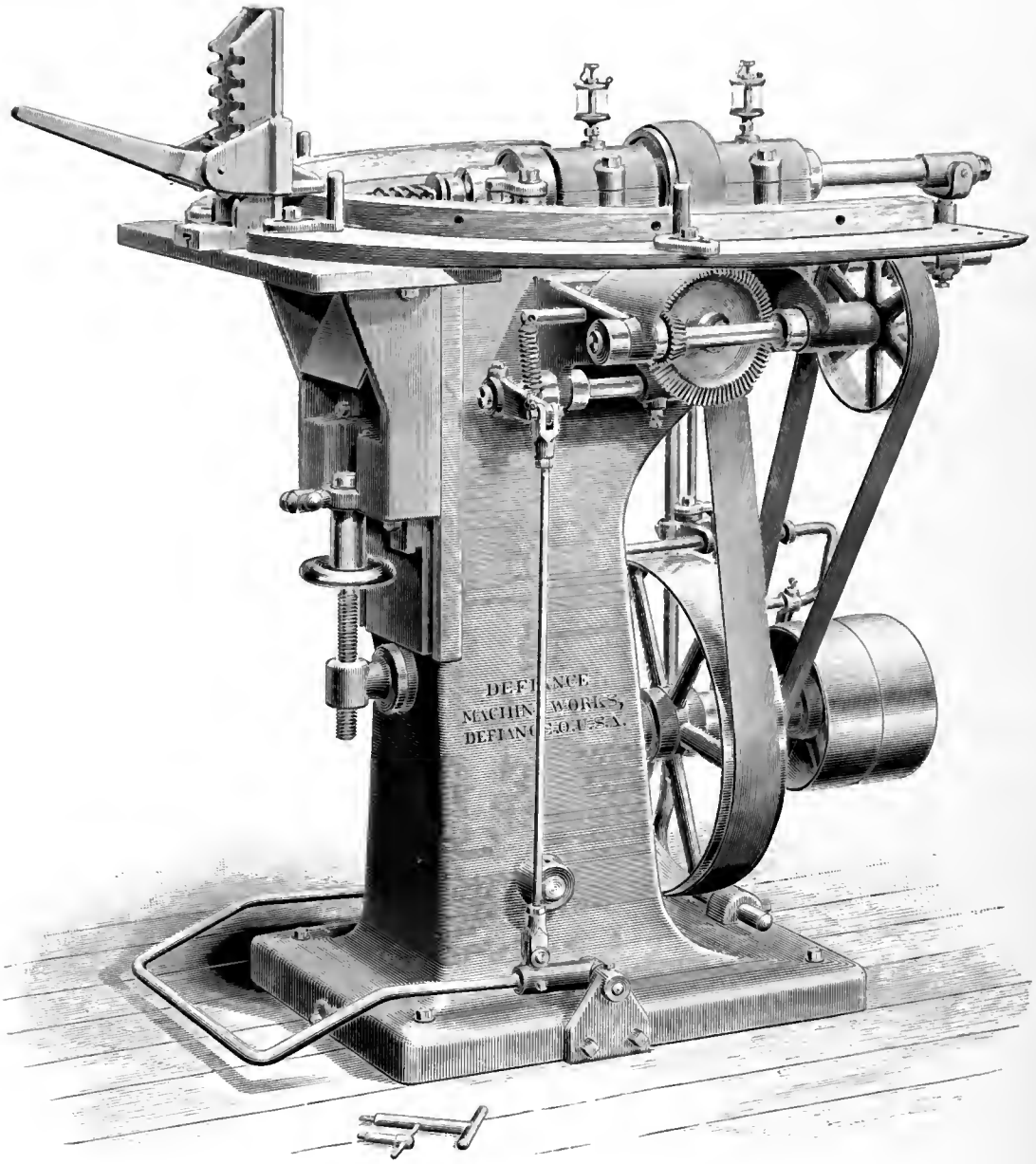
THE TABLE is gibbed to the frame and slides in angle ways, and by means of a single screw is adjusted vertically for different thicknesses of material, and it is supplied with a rack and pinion clamp for holding the rim firmly to the table while boring. When desired, a powerful screw clamp is furnished to compress the rim sufficiently to bore oblong holes.

THE BORING SPINDLE, of hammered steel, is $1\frac{5}{16}$″ diameter, and it slides in a sleeve 15″ long, having suitable feathers to connect them. The outside diameter of the sleeve rotates in genuine babbitt metal boxes in the main frame. By this arrangement the sliding and the rotating movements are confined to separate bearings, which greatly reduces the wear on the spindle and boxes. The spindle is traversed by a convenient foot treadle, which can be reached from the front or either side of the machine, and is fitted with a spring balance, giving a quick, self-return movement. The boring end is fitted with a universal chuck. An adjustable collar is used for graduating the depth of hole to be bored.

AN INGENIOUS PNEUMATIC CUSHION attached to the boring end of the spindle, immediately behind the chuck, entirely avoids shock or jar to the spindle when it retreats, which greatly adds to the life of the machine and makes it much more pleasant to operate.

THE COUNTER is a portion of the machine. The tight and loose pulleys are 8″ × 3″; speed, 1,000 rotations per minute; can be belted to from above, below, or either side.

HORSE POWER to drive, ½; floor space occupied, 40″ × 44″.



No. 2 Patent Automatic Rim and Felloe Boring Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 38 Feet.

Cable Word, BALTIC.

No. 2 Patent Automatic Rim and Felloe Boring Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 38 Feet.
Cable Word, BALTIC.

THIS ENGRAVING represents our No. 2 Patent Automatic Power Feed Rim and Felloe Boring Machine, which is used by wheel and vehicle builders to automatically bore the tenon holes in the wheel's rim or felloe for the reception of the spokes. Its capacity is sufficient to bore from the smallest hole up to 2½" diameter, and different depths up to 7" deep. The circular tables upon which the material to be bored is placed can be instantly adjusted to suit any circle from 18" to 84" diameter. They can be reversed, if desired, to bore from the outside of the felloe.

IT IS the greatest improvement in the construction of boring machines so far invented. It has an automatic power feed to the boring spindle, whereby a slight touch of the operator's foot upon the pedal at the base of the machine instantly brings the boring bit up to its work. The feed being regular and steady, a smooth hole is bored. After boring, the spindle instantly returns ready for the next operation.

A PNEUMATIC CUSHION receives the spindle when returning from its work, which entirely overcomes shock or jar, making a soft cushion, free from noise or injury to the machine.

A SELF-SPACING ATTACHMENT is furnished to automatically space the distance between the spoke holes without marking off, which effects a saving in time and does the work more accurately than by the old method of measuring each distance.

IMPROVED CUTTER HEADS are fitted to the boring bits to face off a circular spot around the tenon hole at the same time the boring is performed for the purpose of securing a true surface for the shoulder of the spoke where it rests against the felloe.

BY THIS IMPROVEMENT four times as much work can be accomplished, and of a better quality, over a foot or hand feed machine.

THE FRAME, of neat design, is strong and well proportioned. It is cast in one piece with cored center, with a broad floor base.

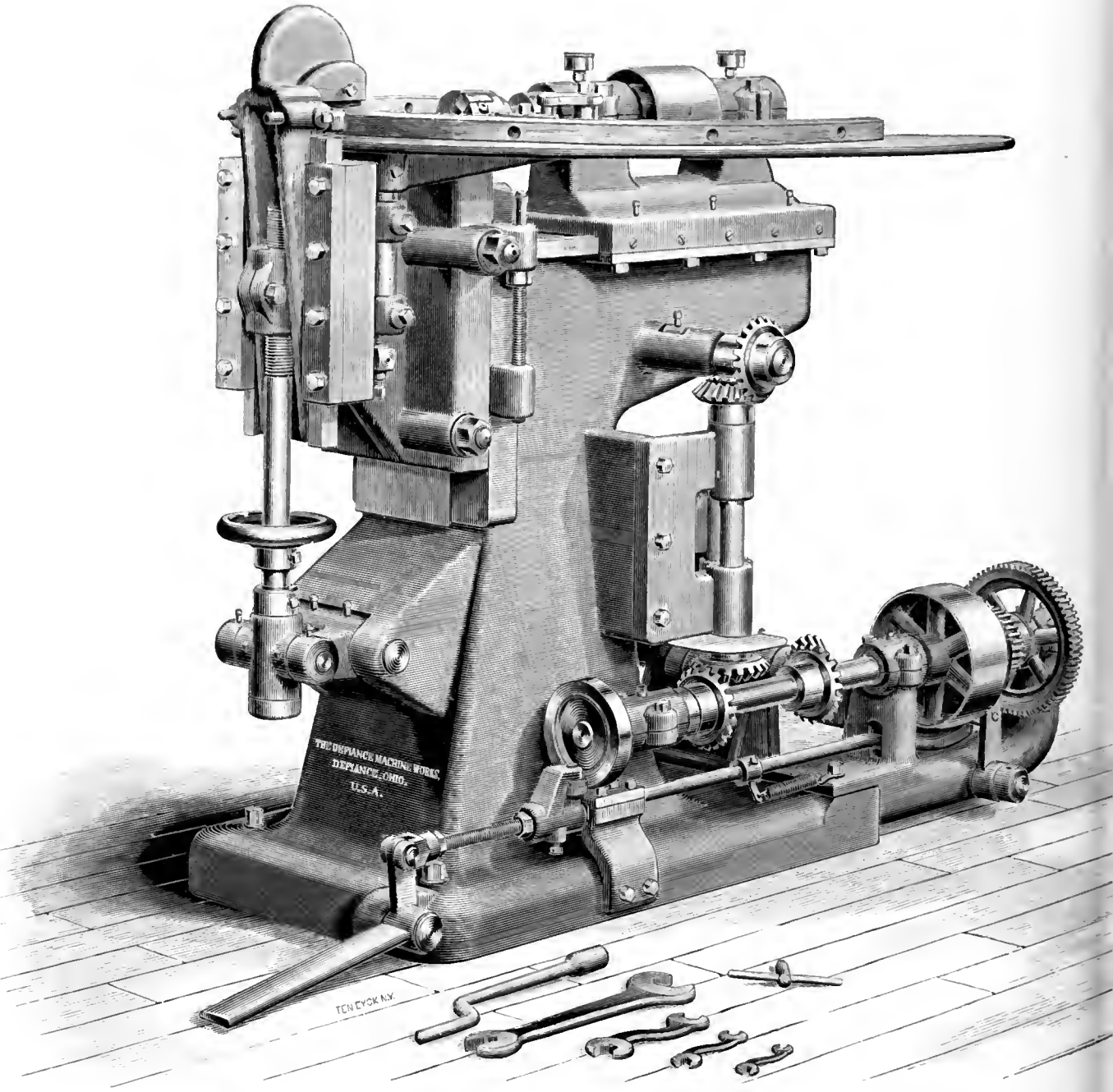
THE TABLE is gibbed to the front of the frame and adjustable vertically by hand wheel and screw for different thicknesses of material, and it is equipped with an ingenious quick-acting jaw to hold the work while boring. When ordered, a powerful screw clamp is furnished to compress the rim for boring oblong holes.

THE BORING SPINDLE, of steel, is of large diameter, and it is fitted through a long sleeve extending from out to out of the boxes. The outside of the sleeve rides in the boxes on the frame of the machine, and the spindle slides in the sleeve. By this device the rotating and sliding movements of the spindle have separate bearings, which greatly reduces the wear over a spindle that runs and slides in the same bearings, as are commonly used on lower priced machines.

A UNIVERSAL CHUCK is fitted to the spindle for holding the bit, and it will open from 0 to ½".

THE COUNTER is a part of the machine. The tight and loose pulleys are 8" × 3"; speed, 1,000 rotations per minute. Can be belted from above, below, or either side.

HORSE POWER to drive, ½; floor space occupied, 40" × 44".



No. 3 Patent Automatic Felloe Boring and Compressing Machine.

Export Shipping Weight, 2,600 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 77 Feet.
Cable Word, BISMARK.

No. 3 Patent Automatic Felloe Boring and Compressing Machine.

Export Shipping Weight, 2,600 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 77 Feet.
Cable Word, BISMARK.

THIS ENGRAVING represents our No. 3 Patent Automatic Felloe Boring and Compressing Machine, used by the builders of vehicle wheels for either light or heavy work, to bore the tenon holes in the felloe for the reception of the spokes. It has sufficient capacity to handle felloes from ½″ up to 8″ wide, in various thicknesses, and bore holes from the smallest sizes up to 3″ diameter. The circular tables upon which the material to be bored is placed can be quickly adjusted to suit any desired circle of felloe, and they can be reversed to bore from either the inside or outside of the work.

IT BORES AND COMPRESSES AUTOMATICALLY, and produces an oblong hole which prevents the felloe from splitting when the spokes are inserted; thus entirely avoiding the expense of using screws on each side of the tenon hole to prevent checking, and it leaves the sides of the felloe smooth.

THE FRAME, of neat design, is cast in one piece, with cored center, of sufficient strength to do the heaviest work with ease. All the working parts are accurately fitted to it.

THE BORING SPINDLE, of steel, is fitted into heavy bearings and provided with a universal chuck to hold the auger, and it is brought forward to its work by a slight touch of the operator's foot upon the pedal at the base of the machine, instantly doing its work and returning automatically ready to repeat the operation when the operator's foot is again applied to the pedal. The feed being regular, the boring is accomplished smooth, without injury to the boring tool.

THE AUTOMATIC COMPRESS is very powerful and it can be quickly adjusted for felloes of different width. It pinches the felloe when the boring spindle starts forward, and does not release its grip until the auger has left the bored hole. The movement of the boring spindle and the compress act together automatically, without any attention on the part of the operator, excepting to move the work and touch the foot pedal, leaving both hands free to handle the felloe.

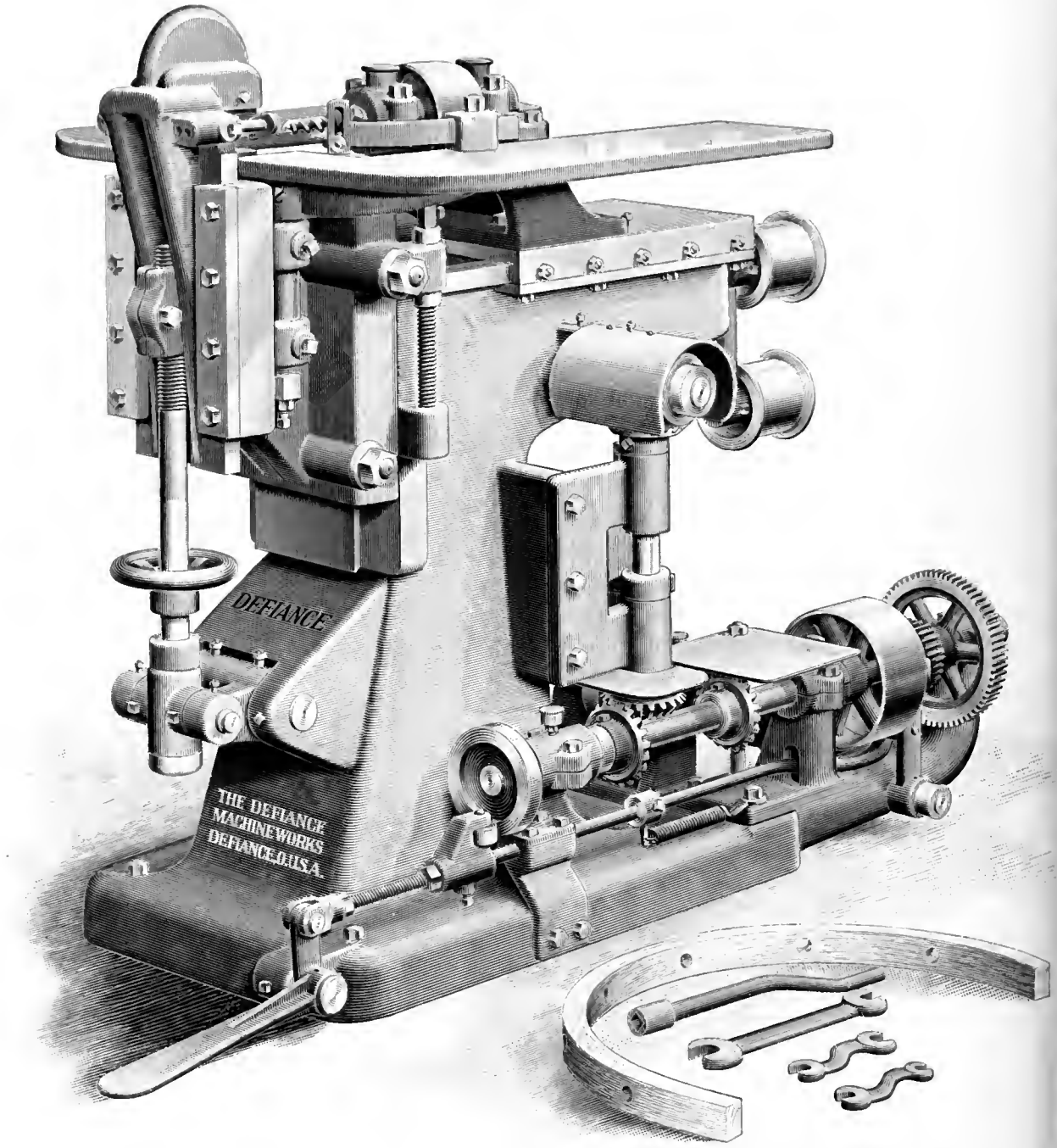
THE SELF-SPACING ATTACHMENT on the table accurately spaces the distance between the spoke holes, saving the time of marking out the work, as by the old process.

IMPROVED CUTTER HEADS are furnished with the boring bits to face off a circular spot around the tenon hole on the inside of rim at the same time the boring is performed, to secure a true surface for the shoulder of the tenon against the rim.

THIS MACHINE is fitted with large wearing surfaces and cut gears throughout. It is noiseless in its operation, and is capable of doing its work better and at a large saving over any other system.

THE COUNTER is furnished as follows: Shaft, 1⅞″×76″; two No. 2 ball and socket adjustable drop hangers; two pair of tight and loose pulleys, 12″×5″, speed of one pair 740 turns for ordinary work, speed of the other pair 380 turns per minute for heavy work; one 2½″ × 3″ flange pulley for feed; one drum 28″ × 12″ face.

HORSE POWER to drive, 2; floor space occupied, 66″ × 66″.



No. 4 Patent Automobile Felloe Boring and Compressing Machine.

Export Shipping Weight, 2,600 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 77 Feet.

Cable Word, BASILUZZA.

No. 4 Patent Automobile Felloe Boring and Compressing Machine.

Export Shipping Weight, 2,600 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 77 Feet.

Cable Word, BASILUZZA.

THIS ENGRAVING represents our new No. 4 Patent Automobile Felloe Boring and Compressing Machine, used by the builders of automobile wheels to bore the tenon hole in the felloe for the reception of the spokes. It is capable of handling from the lightest to the heaviest work in various diameters. It bores and compresses automatically and produces an oblong hole which prevents the felloe from splitting when the spokes are inserted, avoiding the expense of placing screws through the felloe at each side of the tenon hole.

THE FRAME, of modern design, is cast in one piece with cored center of sufficient strength to do the work with ease.

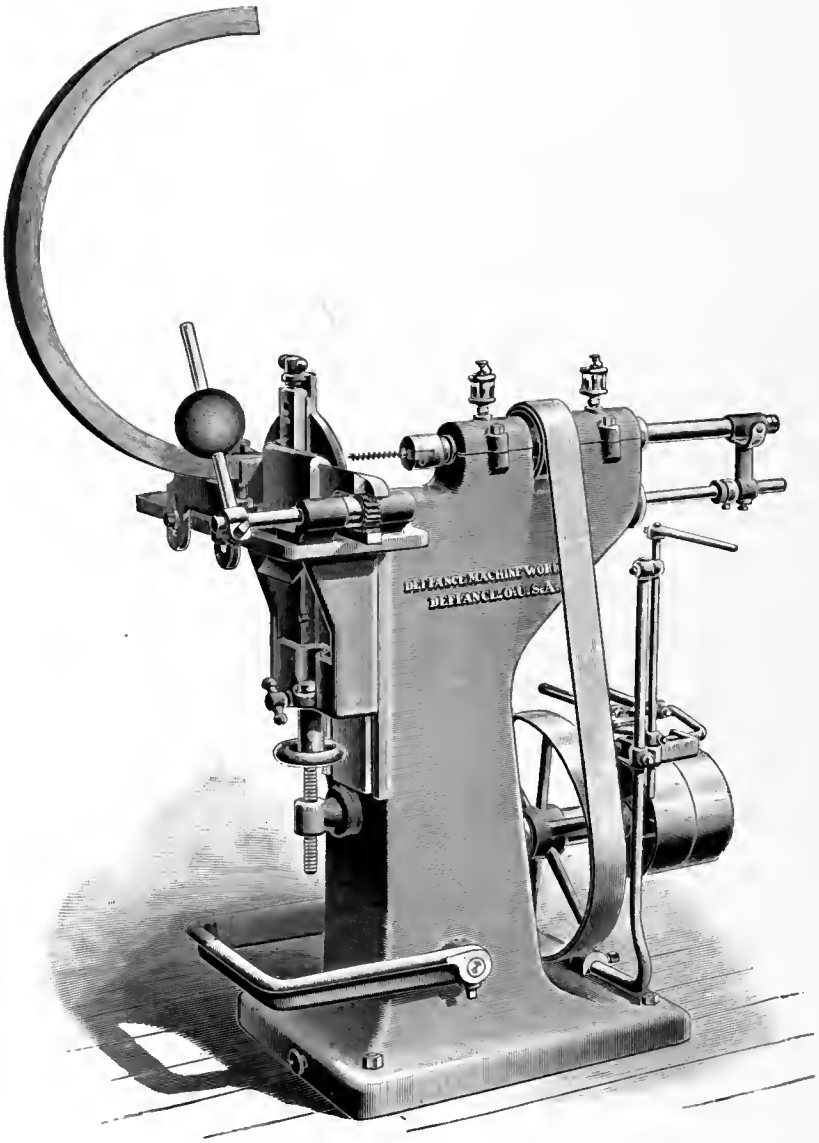
THE BORING SPINDLE, of ground steel, is fitted into heavy self-lubricating bearings which move horizontally to and from its work by a power feed. A slight touch of the operator's foot upon the pedal instantly brings the boring bit forward, which quickly bores the hole and returns automatically, ready to repeat the operation when the operator's foot is again applied to the pedal.

THE AUTOMATIC COMPRESS is very powerful and it can be quickly adjusted for felloes of different widths. It grips the felloe when the boring spindle starts forward and does not release its hold until the auger has left the bored hole. The movement of the boring spindle and the compress act together automatically, leaving both hands of the operator free to handle the felloe.

THE TABLES upon which the felloe rests are adjustable for work of various diameters and thicknesses, and they are fitted with a self-spacing device to accurately space the distance between the spoke holes without any care on the part of the operator.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}'' \times 76''$; two No. 2 ball and socket adjustable drop hangers; tight and loose pulleys, $12'' \times 5''$; speed, 740 turns per minute; one $2\frac{1}{2}'' \times 3''$ flange pulley for driving the feed; one drum, $28'' \times 12''$ face.

HORSE POWER to drive, 2; floor space occupied, $66'' \times 66''$.



No. 1 Patent Felloe Dowel Hole Boring Machine.

Export Shipping Weight, 900 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 38 Feet.

Cable Word, BALL.

No. 1 Patent Felloe Dowel Hole Boring Machine.

Export Shipping Weight, 900 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 38 Feet.

Cable Word, BALL.

WHEEL MANUFACTURERS who are aiming to build their work accurately, in the shortest possible time, with cheap help, find it necessary, in order to gain this point, that the employment of separate and special machines for each part of the work is absolutely necessary. Combined machines for rim-boring, cutting off and doweling, as other wood-working machines that have been designed to meet several wants, have proven by actual use to be a thing of the past.

THE ENGRAVING on opposite page represents a most complete machine for correctly boring the dowel holes in rims and felloes, with few and simple parts; the machine can be quickly changed from one size of work to another, admitting from the smallest rims to 4″ wide. A special wide opening jaw can be furnished to take rims up to 6″ wide when so ordered.

THE FRAME is cast in one piece, cored out, combining neatness and strength.

THE TABLE is fitted to the frame in planed ways, provided with gibs, and is adjustable by hand wheel and screw for setting the end of rim central with the boring bit. The tread side of rim rests upon an adjustable fence, which is provided with adjusting stops on either side, between which the rim is placed, with the end of the rim firmly secured between two steel jaws, which travel in angle ways, propelled by a double steel rack and pinion; by a single turn of the hand lever the jaws act together, gripping the rim central to the bit.

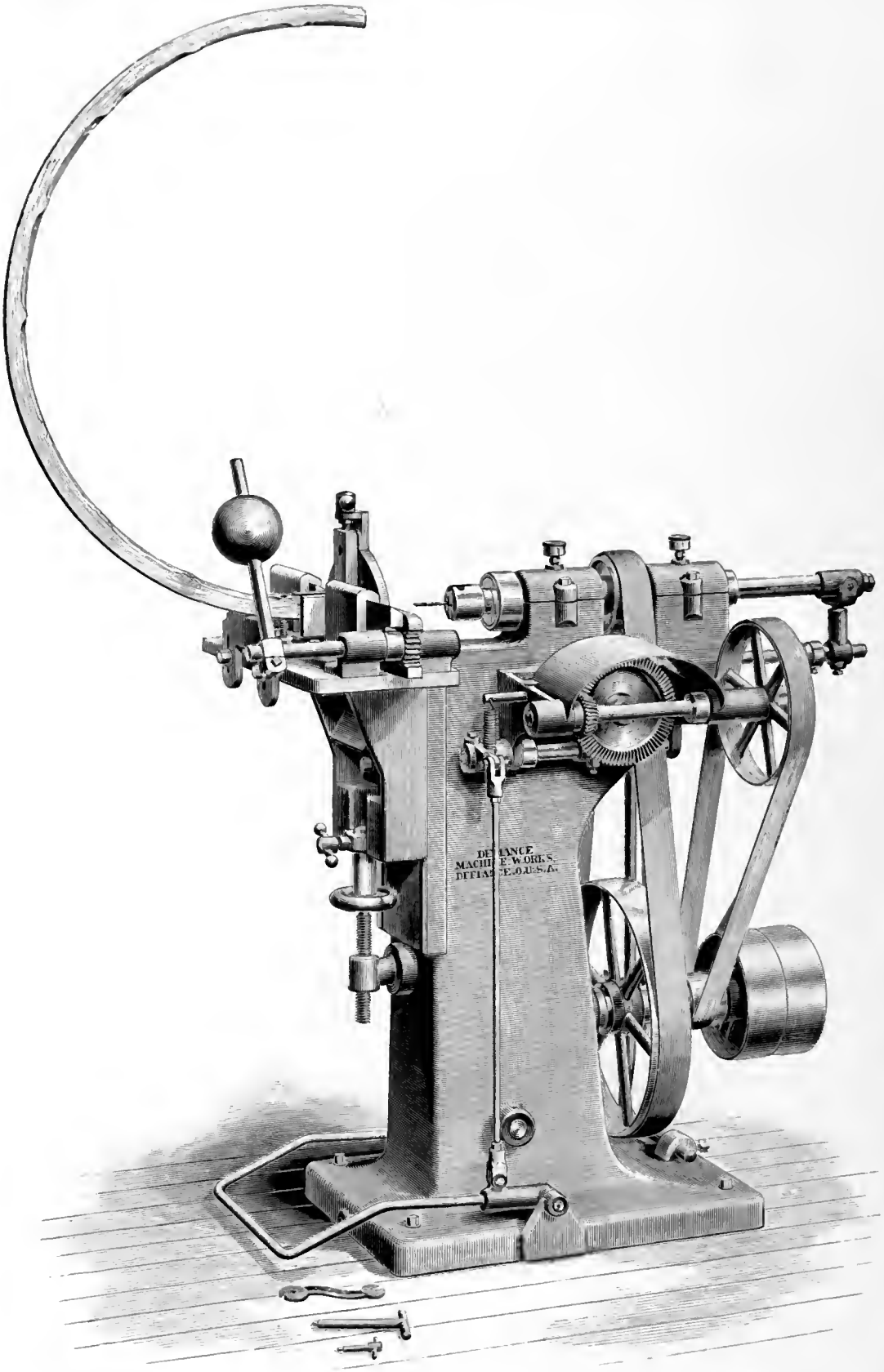
THE SPINDLE is made from forged steel and is $1\frac{7}{16}$″ diameter, provided at the boring end with a self-centering universal chuck for holding the bit. The bearings are filled with genuine babbitt metal with self-lubricating oil cellars.

THE FOOT TREADLE is large, surrounding the entire front of the machine; can be reached from either side. A double coil spring is attached to the treadle shaft on the inside of frame for giving a quick self-return to spindle.

THE OPERATION of this machine is quick and simple, performing the work with accuracy, making the ends of rims or felloes agree with each other when placed in position on the wheels, effecting a saving of time in the fitting department and producing the work cheaper than by any other method.

A COUNTERSHAFT is attached to the machine; tight and loose pulleys, 8″ × 2½″; speed, 1,000 revolutions per minute.

HORSE POWER to drive, ½; floor space occupied, 24″ × 46″.



No. 2 Patent Automatic Felloe Dowel Hole Boring Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 900 Pounds.
Cubic Measurement, 38 Feet.
Cable Word, BEBE.

No. 2 Patent Automatic Felloe Dowel Hole Boring Machine.

Export Shipping Weight, 1,100 Pounds.

Net Weight, 900 Pounds.

Cubic Measurement, 38 Feet.

Cable Word, BEBE.

THIS ENGRAVING represents our No. 2 Automatic Felloe Dowel Hole Boring Machine, which has been designed for rapidly and accurately boring the ends of bent or sawed felloes to receive the dowel pins previous to fitting them to the wheel. The construction of this machine is such that the boring is performed absolutely true, making the felloes register alike when placed together, without any care on the part of the operator, and with its large capacity one operator can handle this and several other rim machines such as are used for rounding, boring and polishing, by setting the machines convenient to each other. In most cases one operator will handle three or four of our automatic machines.

THE FRAME is cast in one piece, with cored center of neat design, and a broad floor base to stand firm.

THE TABLE is fitted to the front of the frame in planed angle ways provided with gibs and adjustable up or down by hand wheel and screw, to bring the work central with the boring bit. A novel self-centering device is fitted to the top of the table, consisting of a right and left hand jaw, or vise, propelled by a double rack and pinion for opening and closing the jaws, to center the felloe sidewise to the boring bit and hold it firmly in position while being bored. A single movement of the hand lever with ball attached grips or releases the work when moved from right to left, requiring no skill on the part of the operator to handle the machine and accomplish accurate work.

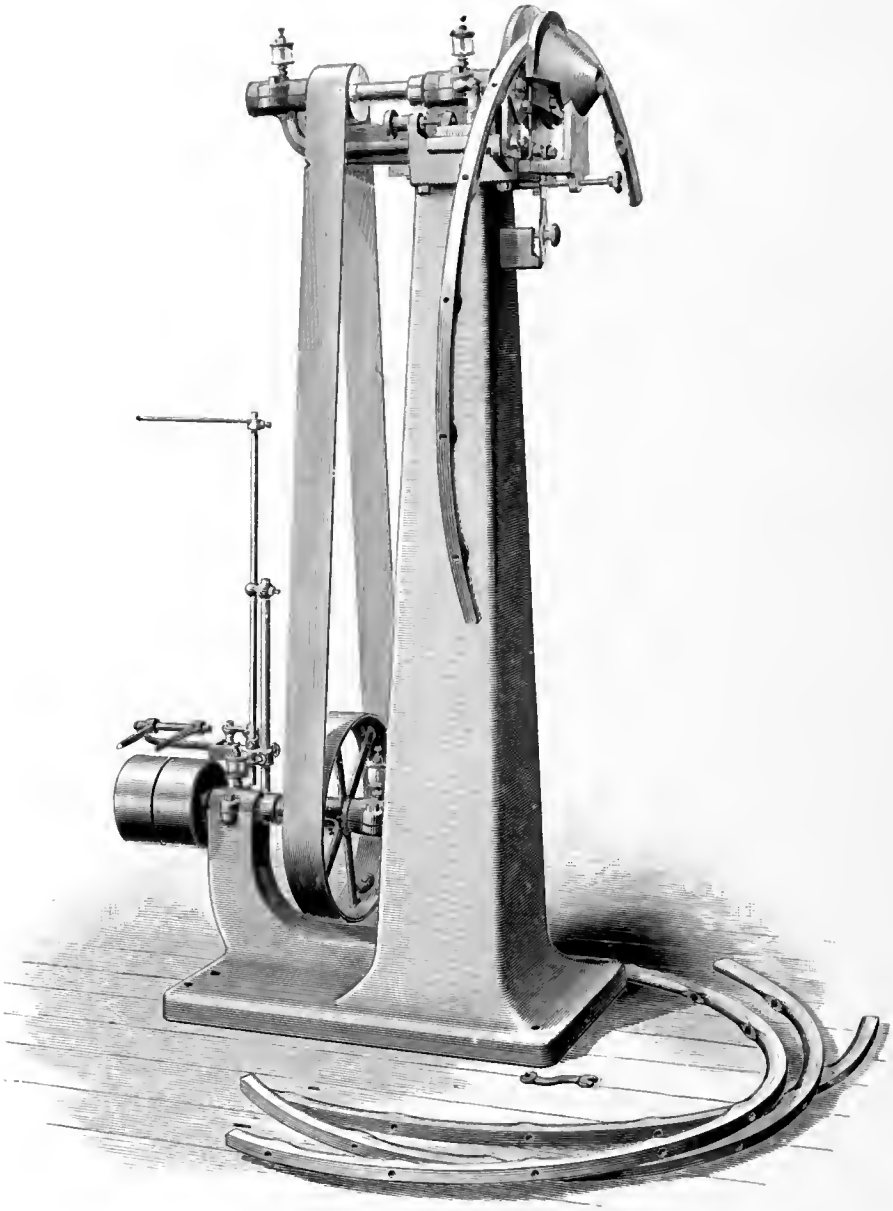
THE BORING SPINDLE, of forged steel, runs in large self-lubricating bearings. The boring end is fitted with a universal self-centering chuck to properly center and hold the boring bit. The horizontal movement of the spindle is automatic. A slight touch of the operator's foot upon the pedal at the base of the machine instantly brings the boring bit forward to its work, which immediately returns after finishing the boring, ready for the next operation, entirely overcoming any laborious work on the part of the operator as with hand or foot power machines.

A PNEUMATIC CUSHION receives the thrust of the spindle when returning from its work, entirely overcoming shock or jar, making a soft cushion free from noise or injury to the machine.

THIS MACHINE can be successfully handled by cheap labor and produce four or five times more work than by any other method.

THE COUNTER is a portion of the machine. The tight and loose pulleys are 8″ × 2½″, and should run 1,000 turns per minute.

HORSE POWER to drive, ½; floor space occupied, 26″ × 46″.



No. 3 Patent Rim and Felloe Rounding Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 800 Pounds.

Cubic Measurement, 35 Feet.

Cable Word, RUNNING.

No. 3 Patent Rim and Felloe Rounding Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 35 Feet.
Cable Word, RUNNING.

THIS ENGRAVING represents our No. 3 Rim and Felloe Rounding Machine, which is used by wheel and wagon makers for rounding and finishing the inner curve of rims and felloes after they are bent and bored for the spokes.

THE FRAME, of excellent design, is cast in one piece, cored out, which adds materially to strength without unnecessary weight. The base covers sufficient surface to stand firm even without fastening to the floor.

THE CUTTER HEADS are adjustable to receive felloes of different widths and supplied with six capped shear cutting knives, their cutting edges semi-circular in form. A stationary guide-rest between the heads regulates the depth of cut, and a gauge pin upon the periphery of the rest spaces the distance from the spoke hole at which the rounding shall begin and terminate. The pin can be set to round as close to the tenon hole as desired.

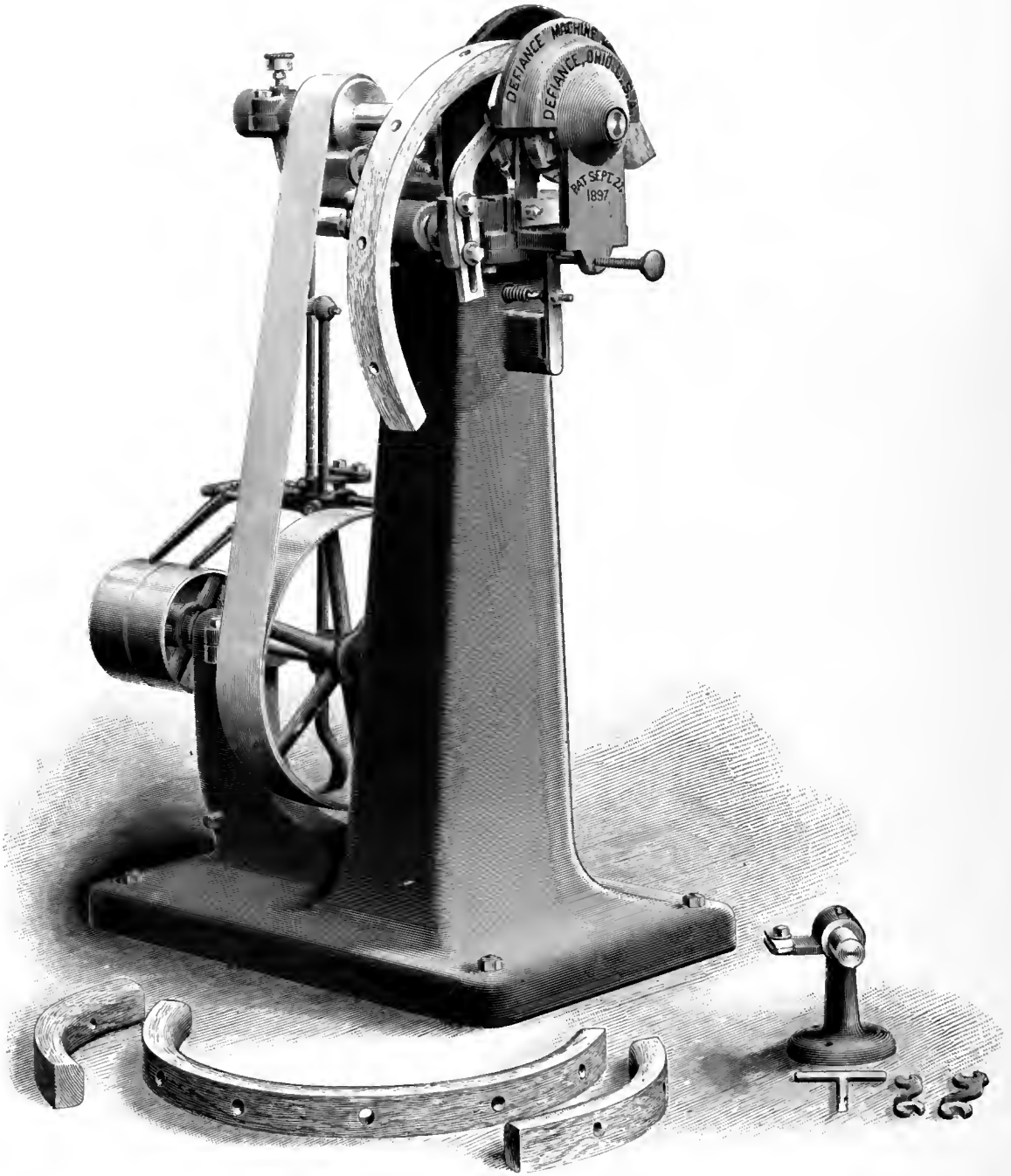
THE RIM OR FELLOE is placed between the guides with the gauge pin in one of the spoke holes, and it is then brought down on the cutters and moved forward, finishing the work smooth and true, complete.

THE CIRCULAR GUIDES, which support the rim sidewise, are adjustable for different widths of felloes and for holding the material to be rounded central with the cutter heads.

IT WILL ROUND rims or felloes of any size, and perform the work without tearing.

THE COUNTER is fitted in substantial bearings cast to the main frame; the shaft is of steel $1\frac{7}{16}''$ diameter; tight and loose pulleys, $7'' \times 3''$; speed, 1,000 rotations per minute for cutter heads not exceeding $5\frac{1}{2}''$ diameter; for greater diameters than $5\frac{1}{2}''$ up to and including $7\frac{1}{8}''$ diameter the speed of counter should be 750 rotations. Can be belted to from above, below, or either side.

HORSE POWER to drive, 1; floor space occupied, $22'' \times 40''$.



No. 4 Patent Automobile Felloe Rounding Machine.

Export Shipping Weight, 750 Pounds.

Net Weight, 450 Pounds.

Cubic Measurement, 26 Feet.

Cable Word, RACER.

No. 4 Patent Automobile Felloe Rounding Machine.

Export Shipping Weight, 750 Pounds.

Net Weight, 450 Pounds.

Cubic Measurement, 26 Feet.

Cable Word, RACER.

THIS ENGRAVING represents our No. 4 Patent Automobile Felloe Rounding Machine, which is used by wheel makers for rounding and finishing the inner curve of felloes after they are bored for the spokes and prepare them for the wheel.

IT IS especially intended for felloes of small diameters such as used on automobiles and other low down vehicles. It will accommodate either narrow or wide felloes up to very heavy work such as used on commercial trucks, handling successfully either bent or sawed sections.

THE FRAME of original design is cast in one piece, with cored center, which adds greatly to the strength without unnecessary weight, the base covering a wide surface on the floor to stand firm.

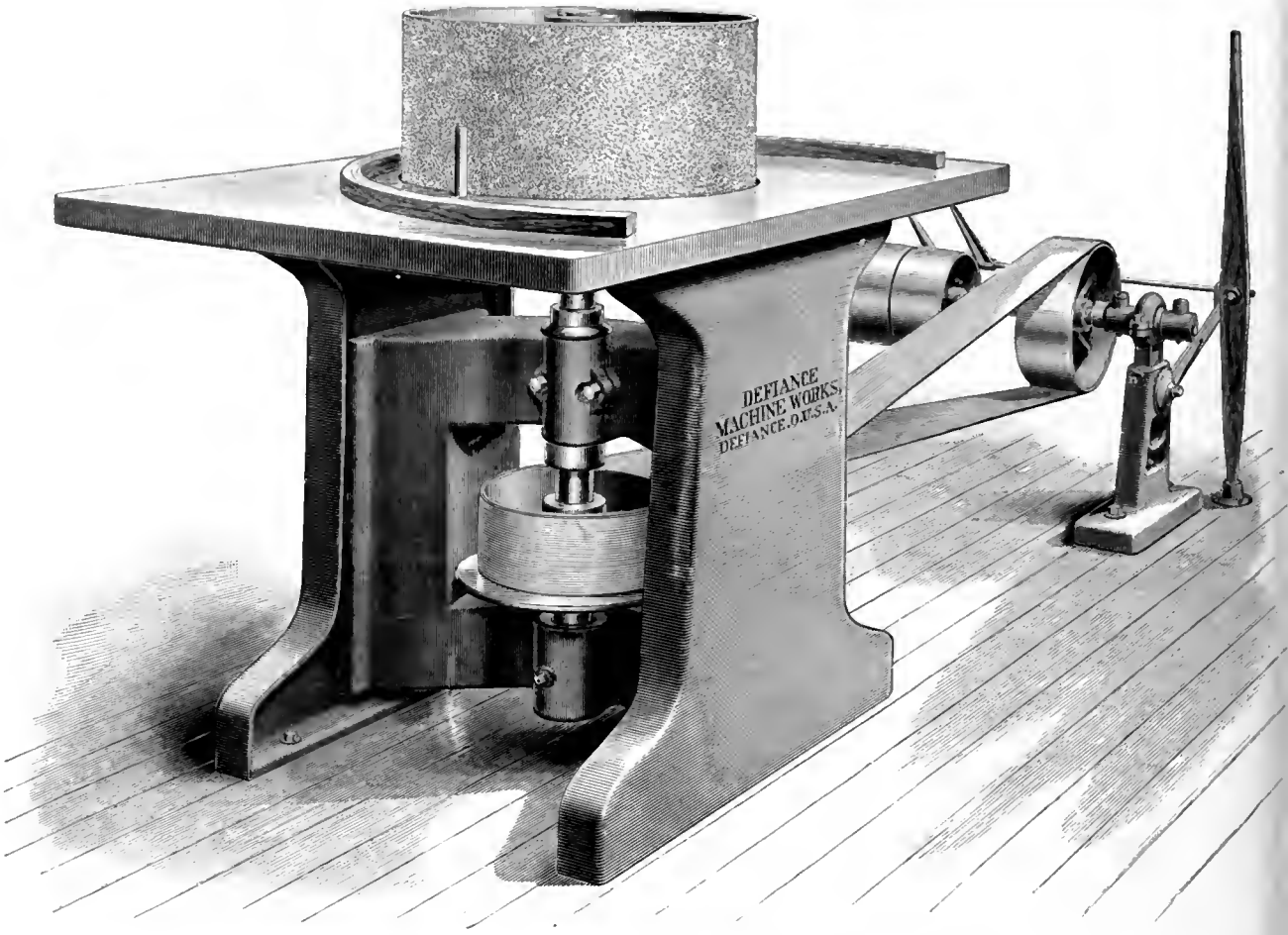
THE VICTOR PATENT CUTTER HEADS are adjustable to receive felloes of different widths, and they are fitted with six capped shear-cutting knives with semi-circular cutting edges to suit the shape of the round to be made. A stationary guide rest between the heads regulates the depth of cut, and the gauge pin upon the periphery of the rest spaces the distance from the spoke hole at which the rounding shall begin and terminate. The pin can be set to round as close to the tenon hole as desired.

THE FELLOE is placed between the guides with the gauge pin in one of the spoke holes, and it is then brought down on the cutters and moved forward, finishing the work smooth and true without lifting the fiber.

THE GUIDES at each side of the cutter head are adjustable to or from each other for different widths of felloes, and to hold the work central with the cutter heads.

THE COUNTER is a part of the machine, and it is supported in substantial bearings cast to the main frame. All the rotating parts are given a running balance. The tight and loose pulleys are 7″ diameter, 3″ face, and should run 1,000 turns per minute. The loose pulley is fitted with bronze bearings, and all the journals are so enclosed as to prevent the admission of dust or dirt, and are self-lubricating.

HORSE POWER to drive, 1; floor space occupied, 22″ × 40′.



No. 0 Felloe Truing and Polishing Machine.

Export Shipping Weight, 2,000 Pounds.
Net Weight, 1,550 Pounds.
Cubic Measurement, 68 Feet.
Cable Word, PEORIA.

THIS MACHINE has been designed for the use of wagon and wheel manufacturers for polishing and truing up the inside circle of bent rims and sawed felloes before they are driven on to the wheel; by its use a large saving is effected over hand labor, and much smoother and cleaner work secured, and where used it has proven a general favorite.

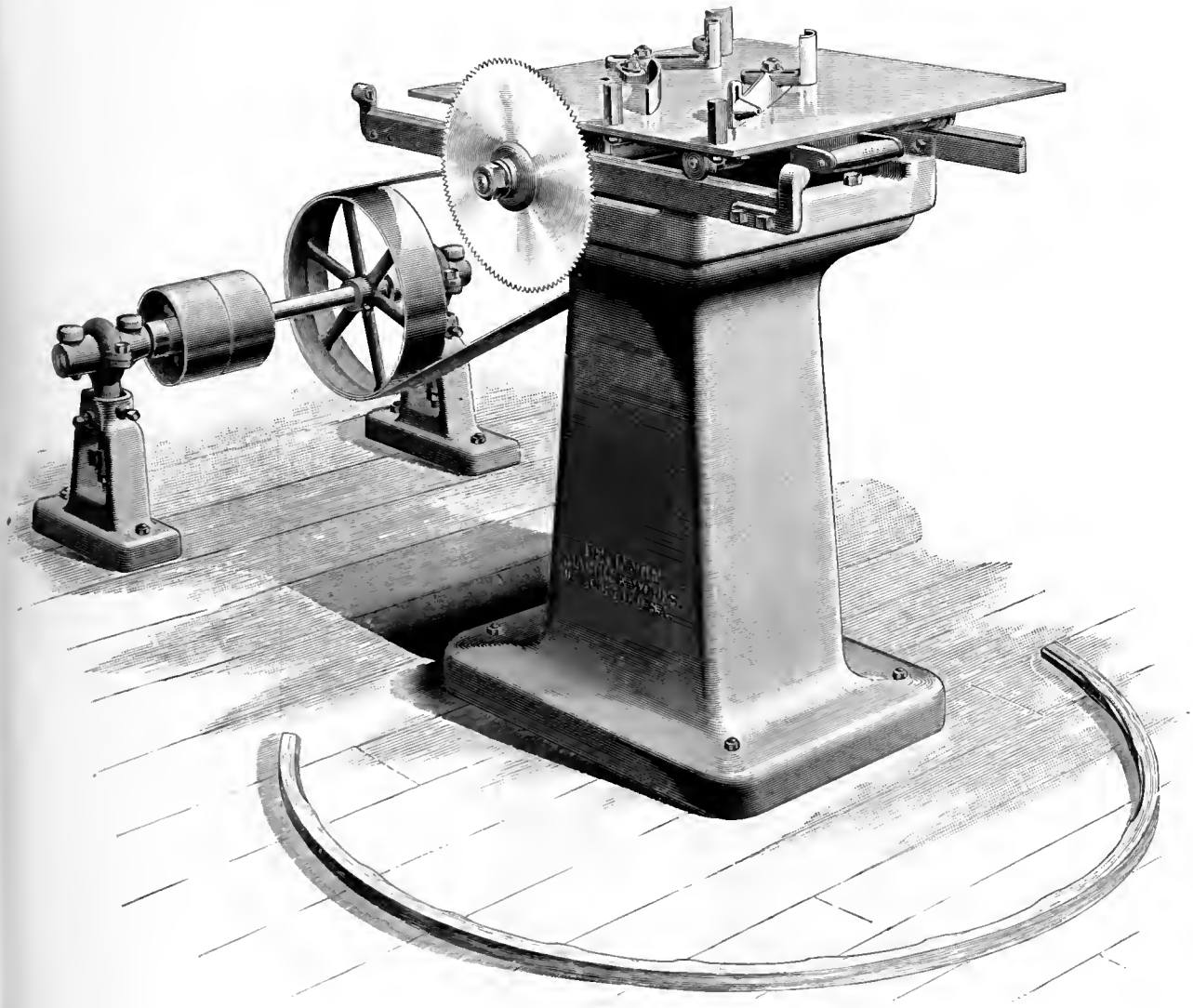
THE TABLE, of iron, is cast in one piece, and planed true over the entire upper surface, securing a perfect bearing for the rim or felloe; it is 36″ wide by 54″ long, and the hole in the center is bored out true, a trifle larger than the diameter of the sandpaper drum, to admit of the drum being adjusted vertically through the hole so that every portion of the sandpaper may be utilized.

THE SANDPAPER DRUM is 22″ diameter, 10″ face, and it is perfectly balanced by our patent process; it is fitted to a vertical steel spindle $2\frac{3}{16}$″ diameter, which runs in connected genuine babbitt metal, self-lubricating bearings, which are so inclosed to prevent the admission of dirt or dust; the drum can be adjusted vertically upon the spindle so that every portion of its face can be used.

THE BODY OF THE MACHINE is extra strong and heavy, and with all the running parts nicely balanced, no jar or vibration occurs when the machine is under motion.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}$″ diameter by 48″ long; two No. 2 ball and socket adjustable floor stands; driving pulley, 14″ × 5″; tight and loose pulleys, 10″ × 5″; speed, 700 rotations per minute; a convenient belt shipper is furnished as shown.

HORSE POWER to drive, 2; floor space occupied, 48″ × 102″.



No. 0 Rim and Felloe Cut-Off Machine.

Export Shipping Weight, 800 Pounds.
Net Weight, 500 Pounds.
Cubic Measurement, 31 Feet.
Cable Word, SCOTLAND.

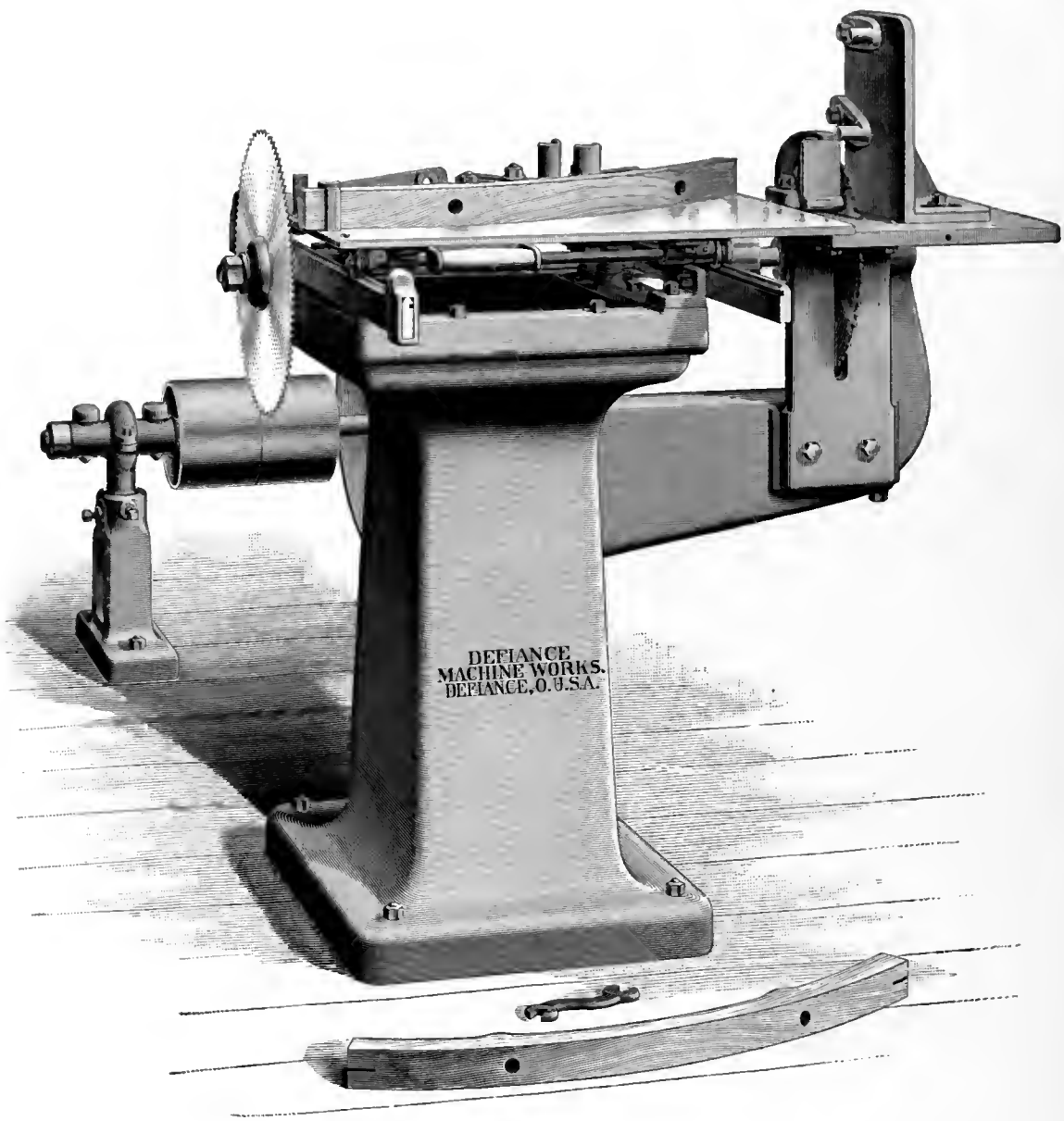
THIS ENGRAVING represents our No. 0 Rim and Felloe Cut-Off Machine, which has been designed for the use of wagon and wheel builders for cutting off the ends of rims and felloes, reducing them to the required length and mitre to fit the wheel.

THE FRAME is cast in one piece with cored center, of neat design, on top of which is mounted a roller table provided with the necessary stops to gauge the position of the cut. The table is gibbed to the ways, so that it cannot rise from its bearings, and it moves to and from the saw with the greatest ease.

THE SAW ARBOR, of steel, is large in diameter and runs in genuine babbitt metal self-oiling bearings. The saw is 12″ diameter.

THE COUNTER is provided with a shaft $1\frac{3}{16}'' \times 36''$; two No. 1 floor stands; driving pulley, $16'' \times 3\frac{1}{2}''$; tight and loose pulleys, $7'' \times 3\frac{1}{2}''$; speed, 600 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, $36'' \times 91''$.



No. 1 Felloe Cut-Off and Doweling Machine.

Export Shipping Weight, 1,250 Pounds.

Net Weight, 750 Pounds.

Cubic Measurement, 53 Feet.

Cable Word, SIQUE

No. 1 Felloe Cut-Off and Doweling Machine.

Export Shipping Weight, 1,250 Pounds.
Net Weight, 750 Pounds.
Cubic Measurement, 53 Feet.
Cable Word, SIQUE.

THIS ENGRAVING represents our No. 1 Felloe Cut-Off and Doweling Machine, which has been designed for the use of wagon and wheel builders, for cutting off the ends of felloes, reducing them to the required length and bevel to fit the arc of the wheel, and sawing the dowel seats complete. By the use of a convenient system of gauges and stops the work can be handled rapidly, and accomplished with accuraey.

THE FRAME is a substantial casting of neat design, in one pieee, with cored center and a broad floor base to stand firm.

THE ROLLER TABLE is mounted on top of the frame, and it slides to and from the saw with the greatest ease. It is planed true on top so that the gauges can be set with accuracy and the work held true. Sufficient adjustment is provided to the gauges for a short or long, small or large, felloe.

THE SAW ARBOR, of steel, large in diameter, runs in genuine babbitt metal self-lubricating bearings.

THE COUNTER is furnished as follows: Shaft, $1\frac{7}{16}'' \times 36''$ long; two No. 1 ball and socket adjustable hangers; driving pulley, $16'' \times 3\frac{1}{2}''$; tight and loose pulleys, $7'' \times 3\frac{1}{2}''$; speed, 600 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, $37'' \times 86''$.

No. 3 Improved Hub Equalizing Saw.

Export Shipping Weight, 1,200 Pounds.
Net Weight, 700 Pounds.
Cubic Measurement, 33 Feet.
Cable Word, SANDUSKY.

THIS MACHINE, as represented by the accompanying engraving, is in general use by wheel makers for equalizing hub blocks from 9″ diameter at the largest and sizes smaller. It cuts both ends off at one operation, square with the sides, thus materially assisting the lathe hand in turning and finishing hubs more promptly, as by this process the blocks are cut smooth and true, allowing but a small surplus in length, sufficient to face off in finishing.

THE SAWS are 24″ diameter, secured to adjusting collars by countersunk screws; will admit being set from 4″ to 9″ apart for various lengths.

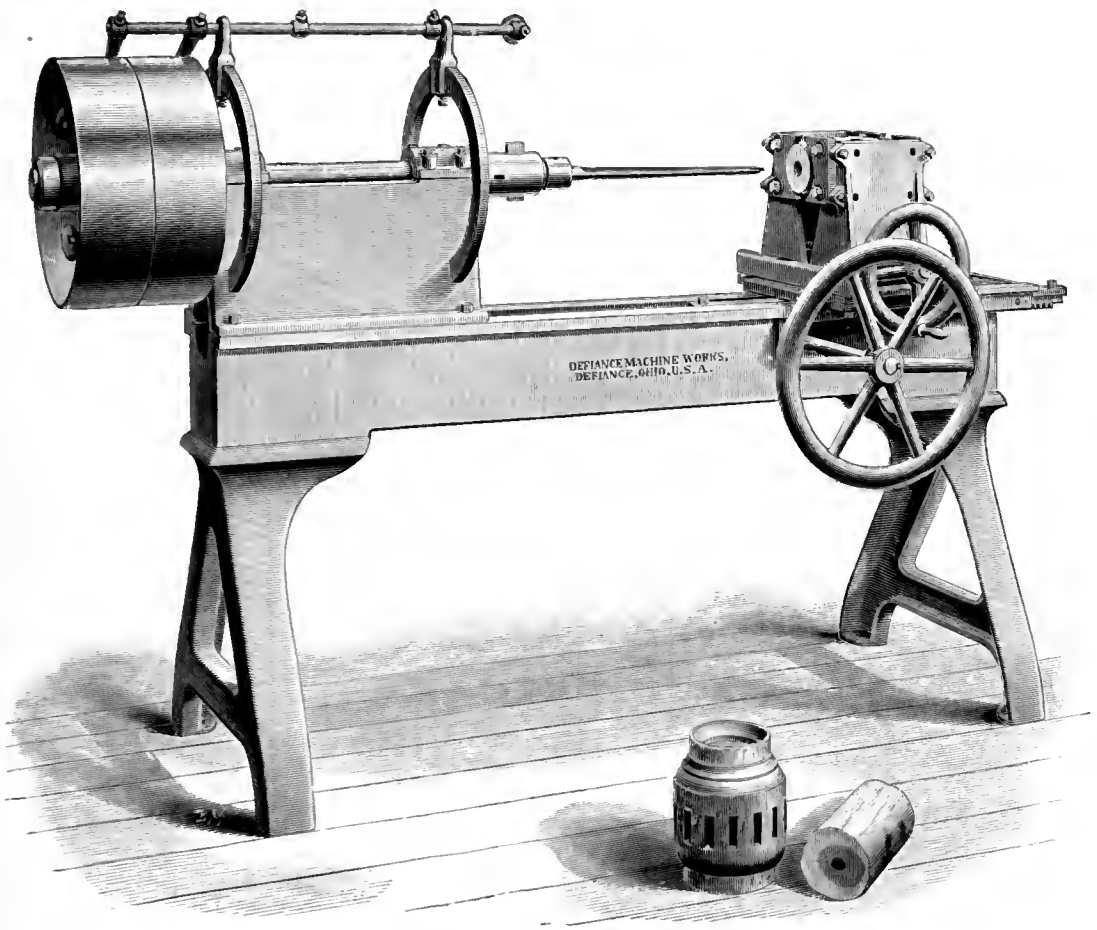
THE SPINDLE is $1\frac{7}{16}$″ diameter, running in large self-oiling, genuine babbitt metal bearings, with driving pulley 6″×6″. Speed, 1,200 revolutions per minute.

THE SADDLE which receives the hub block is fitted to the frame in angle ways, provided with gib, and is adjustable for various diameters. The block is clamped and properly held in position by hand lever, the end of which acts as a lever in operating the sliding carriage to and from the saws.

THIS MACHINE is equally well adapted for cutting other short stuff to exact lengths. When desired a straight table for holding flat or square material is furnished.

THE COUNTERSHAFT, $1\frac{15}{16}$″×42″ long; two No. 2 drop hangers; driver, 18″ ×6″; tight and loose pulleys, 10″×6″; two $1\frac{15}{16}$″ slip collars; one shipper complete. Speed of shaft, 500 rotations per minute.

HORSE POWER to drive, $2\frac{1}{2}$; floor space occupied, 26″×28″.



No. 3 Hub Reaming and Boring Machine.

Export Shipping Weight, 1,300 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 54 Feet.
Cable Word, RALEIGH.

THIS MACHINE is designed particularly for the lighter kinds of hub boring and reaming in wheel factories, to enlarge the hole in the hub block and give it the proper taper to suit the hub lathe mandrel upon which the block is turned and finished. It is equally well adapted for reaming the mortise chips from the finished hub.

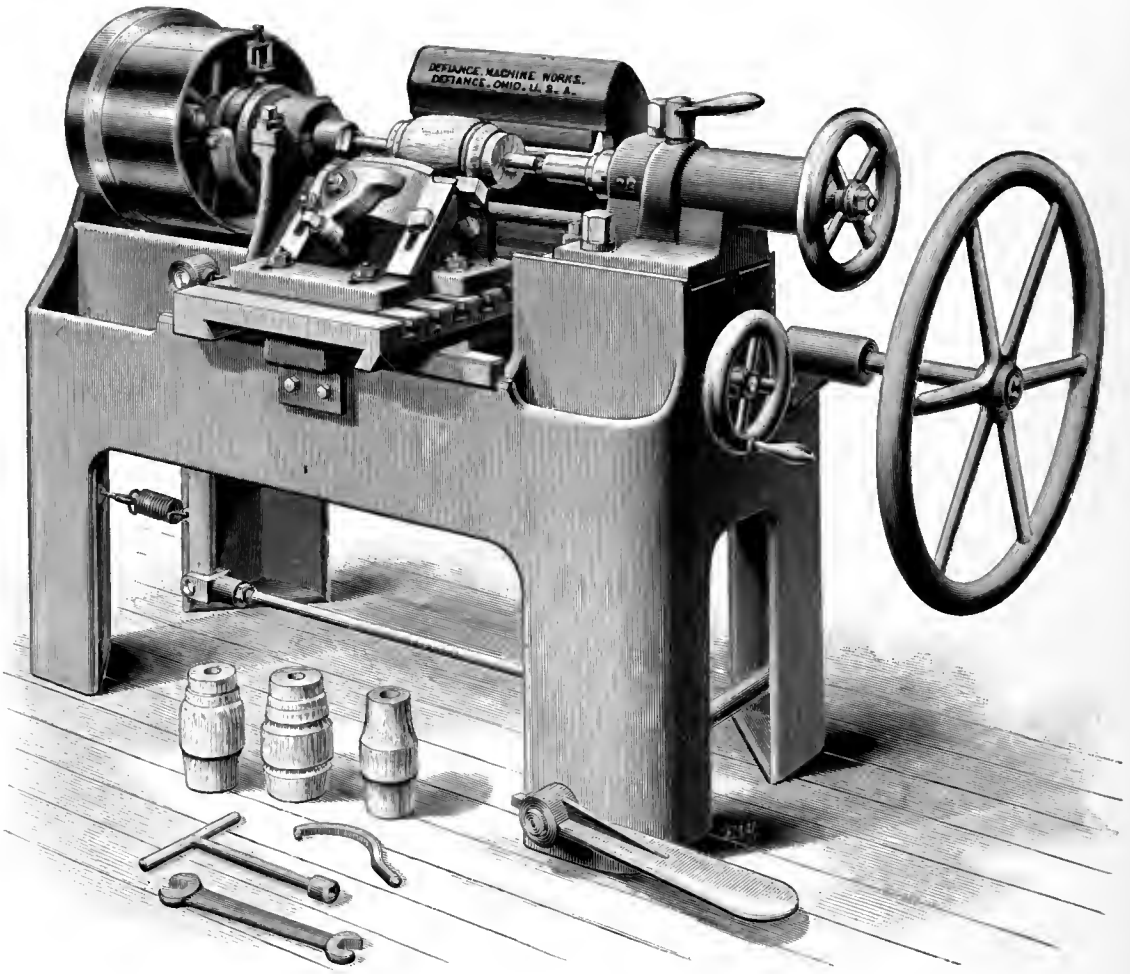
THE FRAME, of iron, is cast in one piece with cored center, and provided with heavy ways planed with accuracy, upon which is mounted the boring frame, which carries a heavy arbor with the tight and loose pulleys placed upon the outer end, admitting belting to from any direction.

THE HUB CARRIAGE is gibbed to the ways of the frame and supplied with two jaws, which are self-centering, opening and closing simultaneously by a right and left hand-screw operated by the small hand-wheel, receiving hubs up to 7″ diameter, 15″ long at the largest, and sizes smaller.

THE HUB, after being clamped between the jaws, is presented to the action of the reamer by turning the large hand-wheel; 3,000 hubs can be bored in ten hours.

THE TIGHT AND LOOSE PULLEYS are 16″ × 4″; speed, 500 rotations per minute. The shifter for throwing the belt from one pulley to another can be adjusted to reach the belt from either side, above or below.

HORSE POWER to drive, ½; floor space occupied, 24″ × 72″.



No. 0 Patent Automatic Hub Turning and Finishing Machine.

Export Shipping Weight, 2,300 Pounds.

Net Weight, 1,800 Pounds.

Cubic Measurement, 50 Feet.

Cable Word, LEVANT.

No. 0 Patent Automatic Hub Turning and Finishing Machine.

Export Shipping Weight, 2,300 Pounds.
Net Weight, 1,800 Pounds.
Cubic Measurement, 50 Feet.
Cable Word, LEVANT.

THIS MACHINE has been designed to reduce the labor in turning carriage wheel hubs, increasing the quantity and improving the quality of work. Previous to its introduction they required to be turned by skillful hand turners at great expense, and thus rarely produced two hubs of uniform shape and size.

THIS WORK is now accomplished by the use of the Patent Automatic Hub Turning and Finishing Machine, in the most perfect manner, turning plain, beaded, banded, Sarven and Warner hubs complete, and finishing them ready to receive the mortises, at the rate of 800 hubs per day, with unskilled labor to operate, and the work is produced more uniform and perfect, at an immense saving over hand turning.

THE ROUGH HUB BLOCK is placed in the machine, which performs the roughing, turning, cutting off and finishing the ends, cutting beads and shoulders for bands, making hubs any size or shape up to 7″ diameter, 9″ long at the largest.

THE WORKING PARTS are mounted upon a heavy iron frame cast in one piece, of sufficient weight to stand firm, free from jar or chatter.

THE TABLE is built in two parts, the lower half is gibbed and fitted to the frame in "V" shaped ways, having adjustment by hand-wheel and screw, horizontally in line with the mandrel to center the knives with the hub block. The upper table, with the roughing and finishing knives attached at each end, is mounted upon and gibbed to the lower table, and it slides from right to left at right angles to the mandrel when turning the large hand-wheel to bring either the roughing or finishing knives up to the hub block to be operated upon.

THE ROUGHING KNIFE, with straight face 12″ long, is firmly secured to a stand at the back end of the sliding carriage, with its cutting edge extending downward, and when in service removes the surplus material from the hub block in the form of a veneer or ribbon $\frac{1}{8}$″ thick, full length at one cut, requiring no adjustment for length or diameter of turning, and is supplied with a gauge to govern the depth of cut.

THE FINISHING KNIVES are located at the opposite end of the carriage from the rougher, with their cutting edges extending upward, consisting of a body knife to turn from the front to back band, with its edge shaped to correspond with the style of hub to be turned. At each end and upon the same stand, the knives for cutting the band seats are placed, each having adjustments for cutting bands of various diameters and widths. The cutting-off knives for finishing the ends of hubs are placed upon separate stands underneath and in advance of the body and band knives.

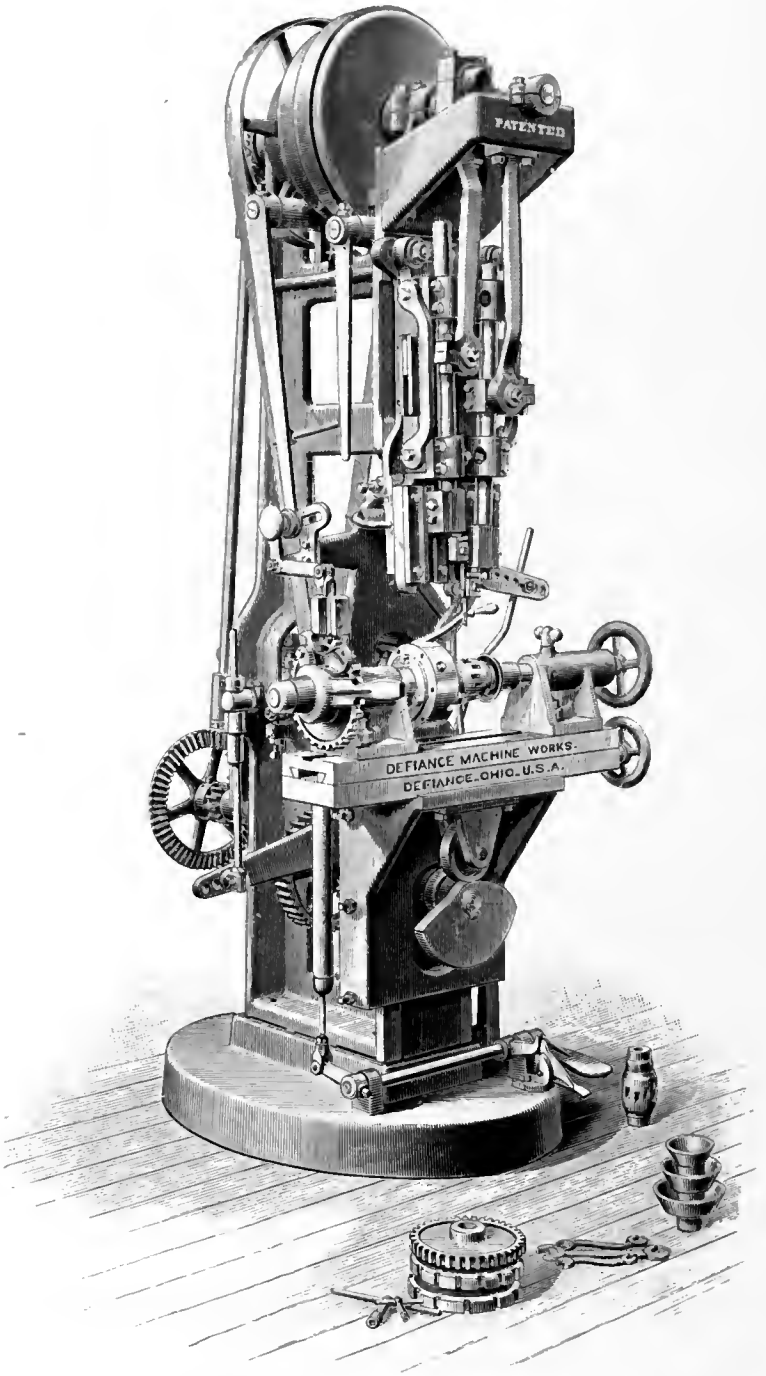
A SINGLE SET OF KNIVES will turn hubs of the same shape to any diameter within the capacity of the machine, but for hubs of different designs it requires extra body knives. The same band and cut-off knives can be used for all classes of hub turning.

THE DRIVING POWER to revolve the hub is communicated through a powerful friction clutch, which is connected by a foot treadle located convenient to the operator. A single movement of the operator's foot upon the treadle instantly starts or stops the machine without shifting the belt or changing position.

THE OPERATOR has complete control over the machine from the working side. As the hub block revolves, the roughing knife is first presented to its action by turning the large hand-wheel to the left, when the hub block is reduced to the proper diameter. By a reverse movement of the hand-wheel the roughing department retreats and the finishing knives are brought into service, which shapes the hub to the desired form and length. The diameter of turning is regulated with graduating screws attached to the carriage, and, when once adjusted, hubs of one diameter are turned to exact size and shape without any attention whatever on the part of the operator. The hub is roughed, turned and polished complete at one starting and stopping.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ diameter; journal, $1\frac{11}{16}$″ diameter; two No. 2 hangers; driver, 24″×6″; "T" and "L" pulleys, 12″×6″; speed, 900 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, 36″×61″.



No. 0 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 3,300 Pounds.

Net Weight, 2,300 Pounds.

Cubic Measurement, 125 Feet.

Cable Word, MIKADO.

No. 0 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 3,300 Pounds.
Net Weight, 2,300 Pounds.
Cubic Measurement, 125 Feet.
Cable Word, MIKADO.

THE No. 0 PATENT DOUBLE CHISEL HUB MORTISING MACHINE, with boring attachment, as shown by the accompanying engraving, is the smallest of the three automatic hub mortising machines we are building, and is used by the makers of carriage wheels to mortise hubs of different sizes up to 6″ diameter at the largest.

THIS MACHINE is entirely automatic in its movements and it will cut either straight or stagger mortises at the rate of 500 hubs in 10 hours, and in many wheel shops two of these machines are handled by a single operator and the work produced at the rate of 1,000 hubs per day.

IT HAS REACHED THE HIGHEST STANDARD of perfection as a labor-saving machine for hub and wheel making, and by its use hubs are mortised with greater accuracy and at an immense saving over the single chisel machine. At the present time fully 90 per cent of the hubs manufactured throughout the United States and Canada are mortised by this machine.

THE COLUMN is cast in one piece and provided with a broad base to stand firm, with the driving power consisting of a double friction clutch at the top, which is driven by a single 3″ belt.

THE CHISEL BARS, of steel, are arranged side by side upon the front of the frame, sliding in genuine babbitt metal bearings, their axis being on a vertical plane, at right angles to the crank shaft. Each has adjustments for giving the mortise the desired dish and taper, and by an automatic spreading device the chisels are opened and closed to form any length of mortise desired. The crank, connecting rods, and cross-heads, of steel, are fitted with phosphor bronze bearings, and an outside bearing stiffens the crank shaft and produces a steady and uniform stroke to the chisels.

THE KNEE upon which the table is mounted is fitted to the frame in angle ways and provided with adjustable gibs to take up for wear, and it is elevated to the chisels by a lifting cam operating on a friction roller. The power to revolve the cam is communicated from the crank shaft through a steel shaft and bevel gears, forming a positive feed, causing the upper and lower movements of the machine to operate in exact time with each other.

THE TABLE holding the hub has a longitudinal and transverse (right angular) adjustment with the chisel bars, for regulating the position of the mortise with the chisels.

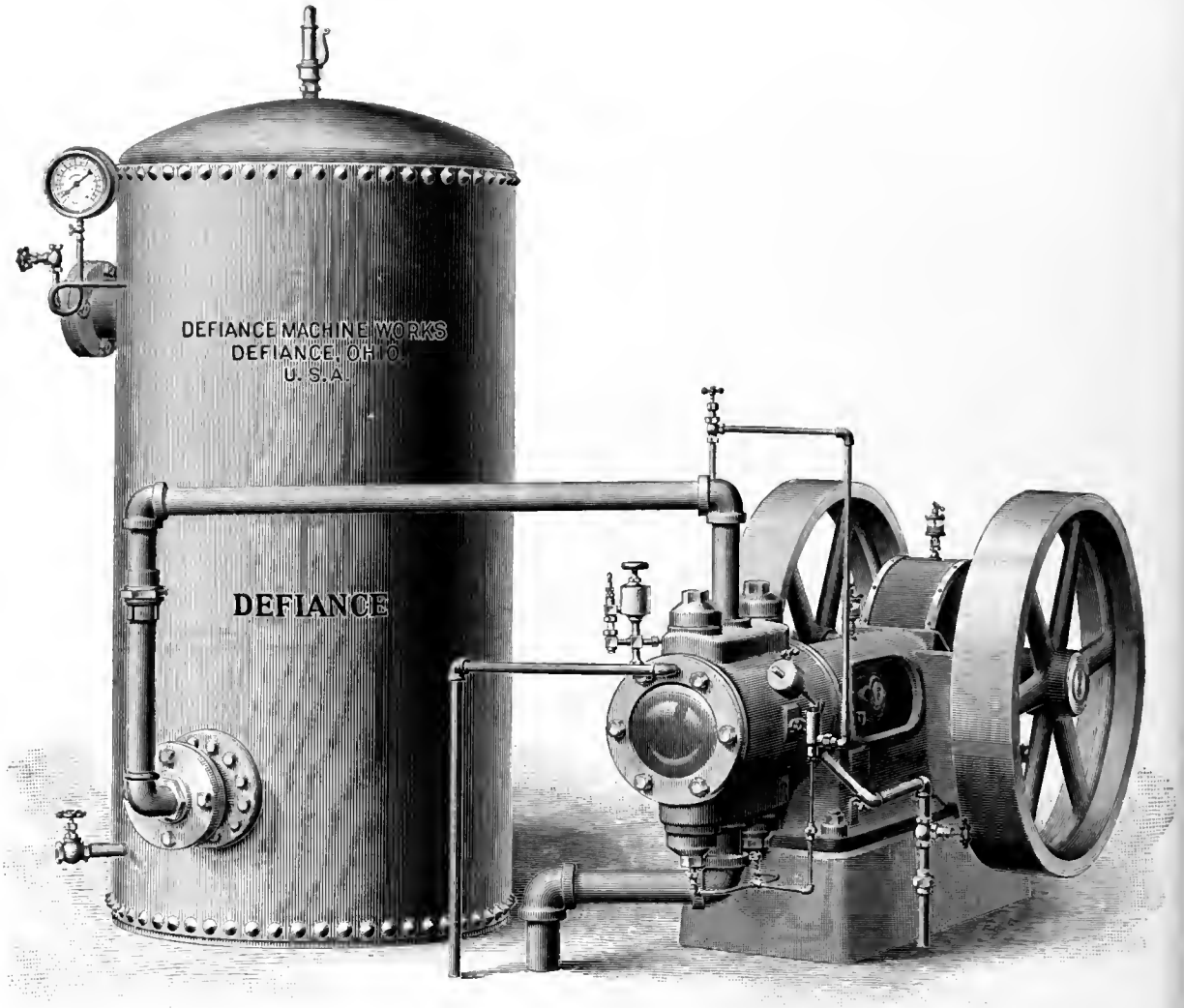
A HORIZONTAL BORING SPINDLE is conveniently fitted through the main frame with a universal chuck for holding the auger, having adjustments to bore holes for straight or stagger mortises. The center of auger and hub agree when the bed is at its lowest position.

THE HUB to be mortised is held at one end in a three-jawed universal chuck, the other end turning in a taper cup, and it is automatically presented to the action of the chisels by a vertical movement of the bed. When a mortise is cut, it descends by its own gravity. A dial is attached to the head spindle, having as many notches in its circumferential edge as there are mortises to be cut in the hub, the dial moving the distance of one notch to turn the hub every time a mortise has been cut.

IN OPERATION, the operator has complete control over the machine from the working side. The double friction clutch at the top of the machine is connected with a combined hand and foot lever. The weight of the operator's foot upon the treadle instantly starts the chisel bars, and the table carrying the hub is gradually lifted to the chisels until the full depth of cut is reached, then it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate, ready for the next mortise, and it is again presented to the action of the chisels, and so continuing until the mortises are finished. The jigging, spacing, feeding, etc., are entirely automatic in their movements and all the adjustments are of the simplest character, rendering it easy for unskilled labor to operate the machine.

THE DRIVER is 16″ diameter, 3″ face; speed, 550 rotations per minute, driven by a 3″ belt direct from the main line. The pulley for main line should have 3″ face.

HORSE POWER to drive, 1½; floor space occupied, 36″×40″.



No. 201 Belt Driven Air Compressor and Receiver.

AIR RECEIVER.

Export Shipping Weight, 1,700 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 147 Feet.
Cable Word, RHANRER.

AIR COMPRESSOR.

Export Shipping Weight, 2,400 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 65 Feet.
Cable Word, CHACHAN.

No. 201 Belt Driven Air Compressor and Receiver.

AIR RECEIVER.

Export Shipping Weight, 1,700 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 147 Feet.
Cable Word, RHANRER.

AIR COMPRESSOR.

Export Shipping Weight, 2,400 Pounds.
Net Weight, 2,100 Pounds.
Cubic Measurement, 65 Feet.
Cable Word, CHACHAN.

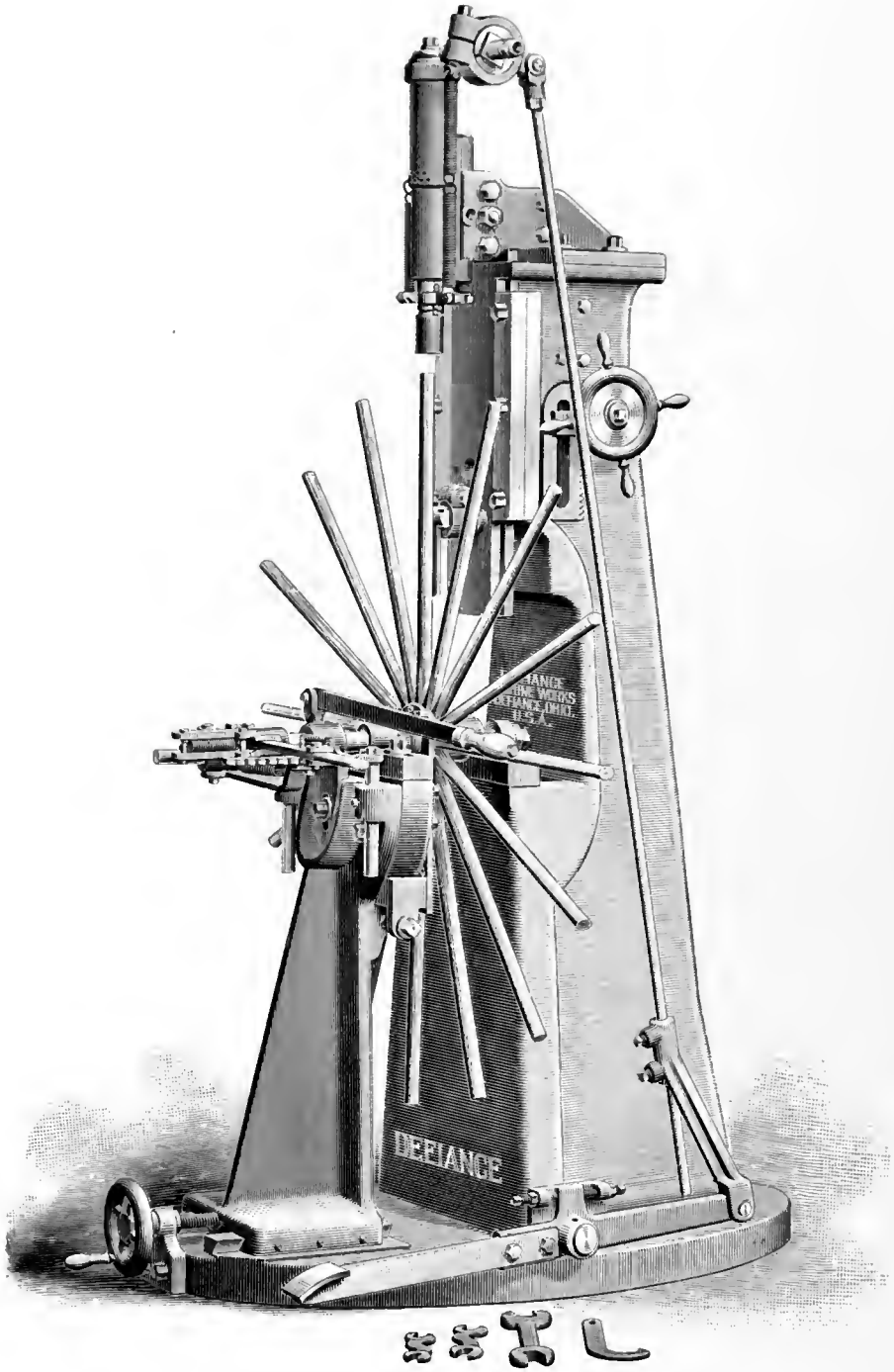
THIS ENGRAVING represents our new No. 201 Belt Driven Air Compressor and Receiver, showing pipe connections, but not necessarily their location to each other, as they can be located in different parts of the building if desired. This equipment is especially designed for supplying air for our No. 0 Patent Pneumatic Spoke Driving Machine, with sufficient capacity for supplying air to operate from one to four drivers, and in addition two riveters for Sarven wheel work. They are equally well adapted for operating other classes of pneumatic tools.

THE AIR COMPRESSOR, of modern design, is accurately constructed in every detail. The cylinder is 8″ bore, 8″ stroke, and it is capable of displacing 75 cubic feet of air per minute at a speed of 160 rotations. The cylinder and heads are water jacketed and provided with automatic unloading device. The air inlet, 2½″; air discharge, 2″; water jacket supply pipe, ½″.

THE AIR RECEIVER is 36″ diameter, 72″ high. It is constructed of the best 60,000 pounds tensile strength steel; side seams double riveted, and tested up to 165 pounds water pressure, and warranted safe and tight up to 110 pounds working pressure. Thickness of shell, ¼″; thickness of heads, ⅜″. Fixtures include safety valve, pressure gauge, drain cocks and flanges for inlet and discharge pipes.

THE DRIVING PULLEY is 36″ × 6″; speed, 160 turns per minute.

HORSE POWER to drive, 12; floor space occupied, 36″ × 75″.



No. 0 Patent Pneumatic Spoke Driving Machine.

Export Shipping Weight, 1,600 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 69 Feet.

Cable Word, DEHANAH.

No. 0 Patent Pneumatic Spoke Driving Machine.

Export Shipping Weight, 1,600 Pounds.

Net Weight, 1,200 Pounds.

Cubic Measurement, 69 Feet.

Cable Word, DEHANAH.

THIS ENGRAVING represents our No. 0 Patent Pneumatic Spoke Driving Machine, especially designed for driving the spokes into carriage and spring wagon hubs. Previous to the introduction of this machine light spokes were driven entirely by hand, which was slow and expensive. All this is now overcome by the use of this machine and unskilled labor, and the work produced accurately at the rate of from 100 to 150 sets of wheels in ten hours, handling from the smallest sizes up to 60″ diameter.

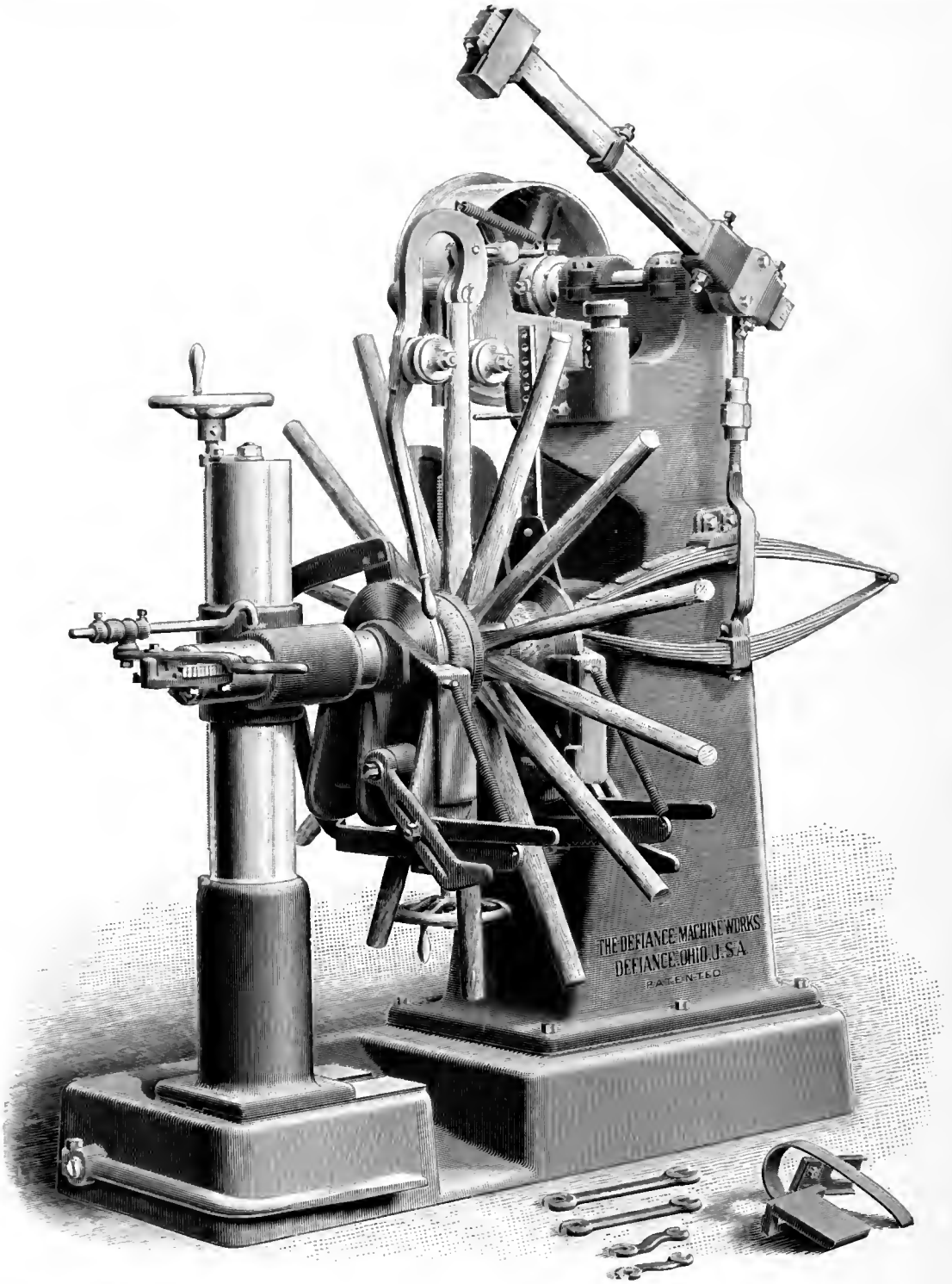
THE COLUMN supporting the working parts is a substantial casting, of neat design, of sufficient strength to withstand the rapid work expected of it and it is provided with a broad floor space to overcome all tendency to jar.

THE SADDLES supporting the hub are adjustable for various lengths and diameters and equipped with a quick-acting hand lever to hold the hub in position while the spokes are being driven.

THE PNEUMATIC HAMMER is fitted to a sliding frame which is gibbed to the front of the main column and it has a vertical adjustment by hand wheel for the length of spoke. The speed of the piston is 800 strokes per minute with an air pressure of 100 pounds. The blows are delivered with sufficient rapidity to counteract the spring in light wheels, entirely overcoming the liability of splitting or injuring the spokes. The air valve is controlled by a convenient foot treadle. The force of the blow is regulated by the amount of pressure applied to the treadle. It will strike quick or slow, light or heavy, as desired. When the pressure of the foot upon the treadle is relieved the hammer is instantly arrested. The air is delivered to the cylinder through ⅜″ pipe opening.

CARE OF HAMMER. Like other classes of machinery, the hammer must receive proper attention and lubrication in order to give satisfactory results. It is an excellent plan to submerge it occasionally over night in a bath of benzine, then blow out under pressure the following morning and lubricate with a good quality of light machine oil. The intake for air to the compressor should be screened to exclude foreign matter usually found in the air.

HORSE POWER to drive, 1; floor space occupied, 30″ × 60″; height, 79″.



Model M Patent Automatic Spoke Driving Machine.

Export Shipping Weight, 3,200 Pounds.

Net Weight, 2,500 Pounds.

Cubic Measurement, 136 Feet.

Cable Word, DREXTEL.

Model M Patent Automatic Spoke Driving Machine.

Export Shipping Weight, 3,200 Pounds.
Net Weight, 2,500 Pounds.
Cubic Measurement, 136 Feet.
Cable Word, DREXTEL.

THIS ENGRAVING represents our Model M Patent Automatic Spoke Driving Machine, used by vehicle wheel builders for driving the spokes into the wheel's hub, which produces a large saving over hand labor and performs the work much more accurately. It is capable of taking hubs from 3″ to 14″ diameter, from 6″ up to 16″ long, and it will accommodate wheels from 24″ to 60″ diameter.

IT IS very similar to our No. 1 Spoke Driving Machine, excepting it is arranged for the operator to handle it from the reverse side. It therefore might be termed a left-handed driver.

THE FRAME is a massive casting in one piece, with cored center, making it very strong and reliable to withstand the heavy labor expected of it. The floor base is wide and substantial to stand firm.

THE HUB is held at each end in a pair of adjustable saddles, having independent vertical adjustment for length of spokes and a horizontal adjustment to accommodate the length of hub.

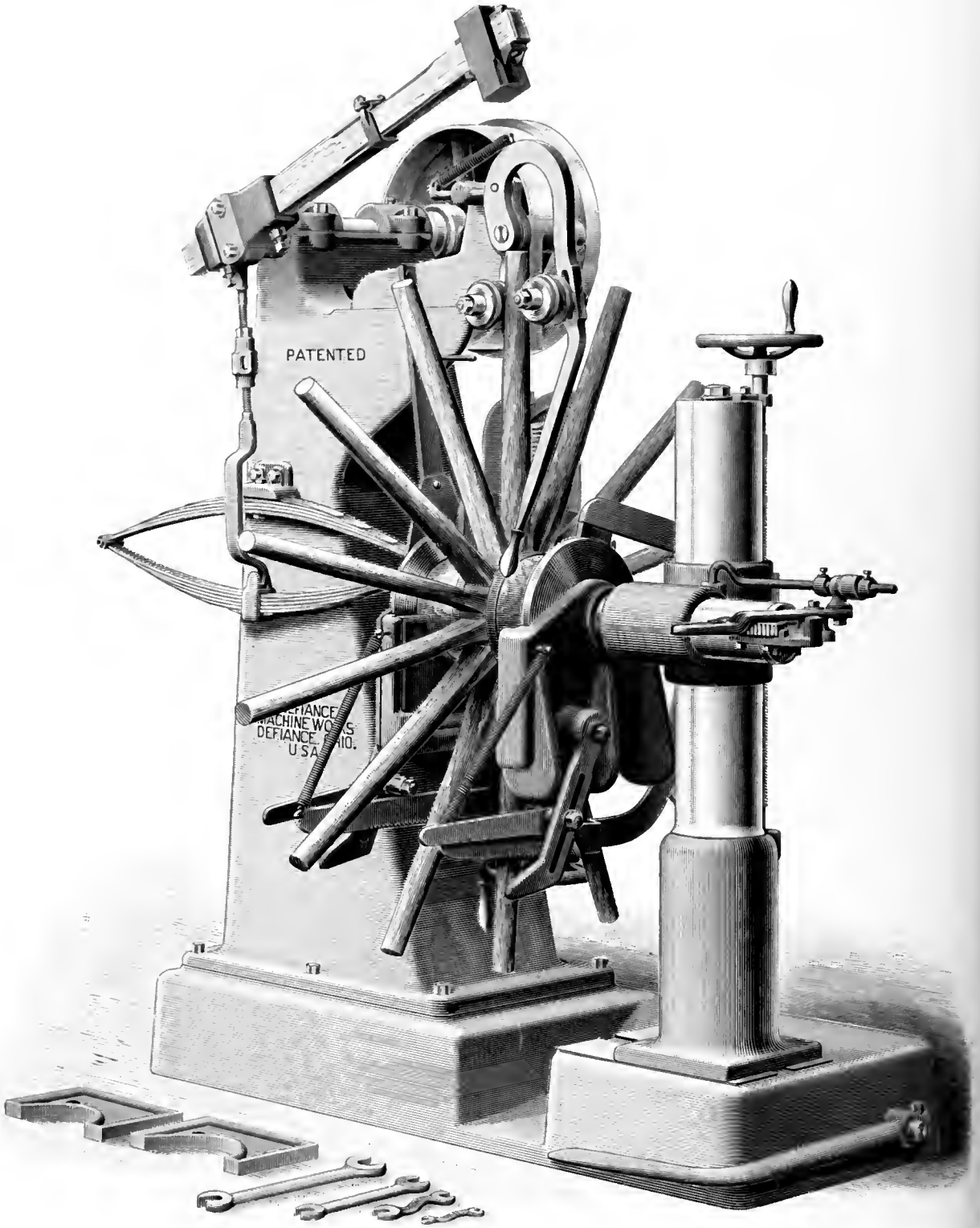
THE HAMMER SHAFT, of steel, of large diameter, runs in heavy self-lubricating bearings, and it is driven by a powerful friction clutch, which is connected by a foot pedal at the base of the machine for starting and stopping the hammer. The hammer is instantly started by a slight touch of the operator's foot upon the pedal, which delivers a blow similar to the swinging of the hammer by hand. The force of the blow is regulated by the pressure applied to the pedal. It will strike quick or slow, heavy or light, as desired to suit the nature of the work, and is automatically stopped when the foot is removed from the pedal. By an ingenious device the frictions are automatically disengaged before the hammer delivers the blow, which prevents shock or injury to the machine, the friction pulley acting as a loose pulley when disengaged, allowing the hammer to swing free.

THE ADJUSTABLE SPOKE GAUGE is conveniently arranged to guide the spoke being driven to exact position, and it is out of the way when not in use. A dish staff is also furnished to test the work.

THE HAMMER HELVE is attached to the machine by a friction binder, and it can be easily removed or replaced when desired. The hammer is of solid steel fitted with a taper bearing to the helve.

THE FRICTION DRIVER is 18″ diameter, 5″ face, driven by a single belt, 250 rotations per minute, and it can be belted from above, below, or either side direct from the main line shaft if desired.

HORSE POWER to drive, 1; floor space occupied, 44″ × 74″.



No. 1 Patent Automatic Spoke Driving Machine.

Export Shipping Weight, 3,400 Pounds.
Net Weight, 2,600 Pounds.
Cubic Measurement, 159 Feet.
Cable Word, DENVER.

No. 1 Patent Automatic Spoke Driving Machine.

Export Shipping Weight, 3,400 Pounds.

Net Weight, 2,600 Pounds.

Cubic Measurement, 159 Feet.

Cable Word, DENVER.

THIS ENGRAVING represents a special machine designed for driving spokes into wagon and carriage hubs. It is extremely simple in its operation, and contains many valuable features over other machines heretofore used for this purpose.

THIS MACHINE is used by the leading wheel and wagon builders. It performs the work more perfectly and at a great saving over hand labor; it will take hubs from 3″ to 14″ diameter, and from 6″ to 16″ long, and accommodate wheels from 24″ to 60″ diameter, and drive from ¾″ to 5″ spokes with perfect success.

THE FRAME is cast in one piece with cored center, making it very stiff and reliable to stand the heavy labor expected of it. The bed plate upon which the frame rests is a heavy casting.

THE HUB to be operated upon is held at each end in a pair of adjustable saddles, having independent vertical adjustments for the length of spoke, and a horizontal adjustment to accommodate the length of hub.

THE UPPER SHAFT supporting the hammer is of steel $2\frac{7}{16}$″ diameter, and it runs in genuine babbitt metal, self-lubricating bearings, and is driven by a powerful friction clutch, which is connected by foot pedal at the base of the machine for starting and stopping the hammer.

WHEN IN USE the foot of the operator is placed upon the pedal, which immediately engages the friction clutch and instantly starts the hammer, which delivers a blow similar to the swinging of the hammer by hand. The force of the blow is regulated by the pressure applied to the pedal. It will strike quick or slow, heavy or light, as desired. By the aid of an ingenious device the frictions are automatically disengaged before the hammer delivers the blow, which prevents shock or injury to the machine. The friction acts as a loose pulley when disengaged.

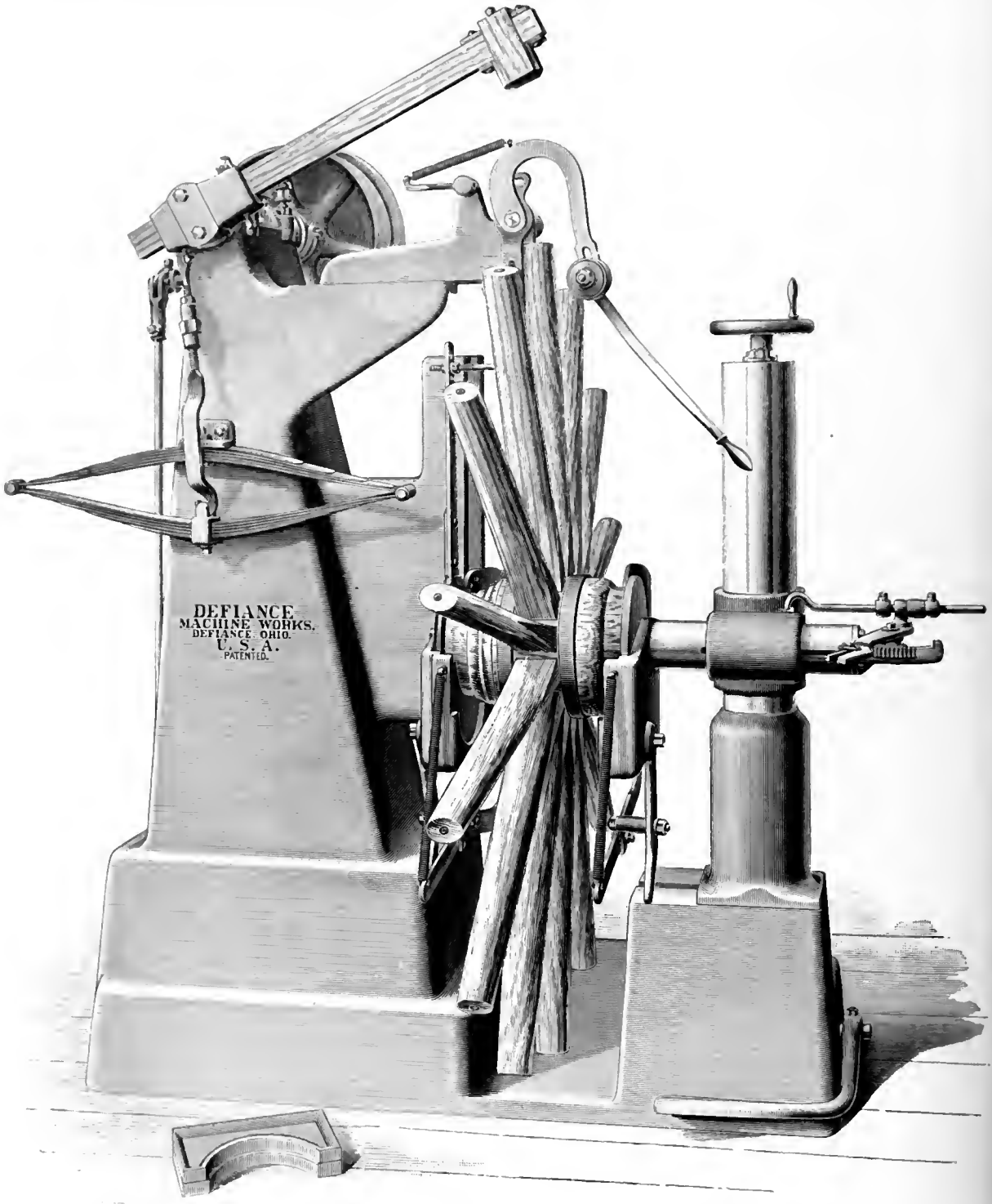
THE GRADUATION OF THE BLOWS is so quickly accomplished that the stroke can be changed after the hammer is started by changing the pressure of the foot upon the pedal.

THE ADJUSTABLE GAUGE is conveniently arranged to guide the spoke being driven, to exact position, returning out of the way when not in use. A dish staff is also furnished to test the work.

THE HAMMER HELVE is attached to the machine by a friction binder, and it is easily removed when desired. The mallet, or hammer proper, is made of solid Swedes iron.

THE FRICTION DRIVER is 18″ × 5″, driven by a single 5″ belt, 250 rotations per minute, and it can be belted to from above, below, or either side, direct from the main line shaft if desired.

HORSE POWER to drive, 1; floor space occupied, 44″ × 74″.



No. 2 Patent Automatic Spoke Driving Machine.

Export Shipping Weight, 3,800 Pounds.
Net Weight, 3,000 Pounds.
Cubic Measurement, 148 Feet.
Cable Word, DIAMOND.

No. 2 Patent Automatic Spoke Driving Machine.

Export Shipping Weight, 3,800 Pounds.

Net Weight, 3,000 Pounds.

Cubic Measurement, 148 Feet.

Cable Word, DIAMOND.

THIS ENGRAVING represents our No. 2 special heavy Patent Automatic Spoke Driving Machine, which has been designed for driving spokes in wagon, truck, and heavy artillery wheels, driving spokes as large as 5″ in diameter in wheels from 24″ to 72″ diameter.

THIS MACHINE is used by the leading wheel and wagon builders, who require a machine to cover both medium and extra heavy work. It performs this work more perfectly and at an immense saving over hand labor. It is extremely simple in its operation, and contains many valuable features over machines heretofore used for this purpose.

THE FRAME is cast in one piece with cored center, making it very stiff and reliable to stand the heavy labor expected from it.

THE BED PLATE, upon which the frame rests, is a heavy casting.

THE HUB to be operated upon is held at each end in a pair of adjustable saddles, having independent vertical adjustments for the length of the spoke and a horizontal adjustment to accommodate the length of the hub.

THE HAMMER SHAFT is of steel, $2\frac{7}{16}$″ diameter, and it runs in genuine babbitt metal self-lubricating bearings, and is driven by a powerful friction clutch, which is connected by foot pedal at the base of the machine for starting and stopping the hammer.

WHEN IN USE the foot of the operator is placed upon the pedal which immediately engages the friction clutch and instantly starts the hammer, which delivers a blow similar to the swinging of a hammer by hand. The force of the blow is regulated by the pressure applied to the pedal. It will strike the blow heavy or light, as desired. By the aid of an ingenious device, the frictions are automatically disengaged before the hammer delivers the blow, which prevents shock or injury to the machine. The friction acts as a loose pulley when disengaged.

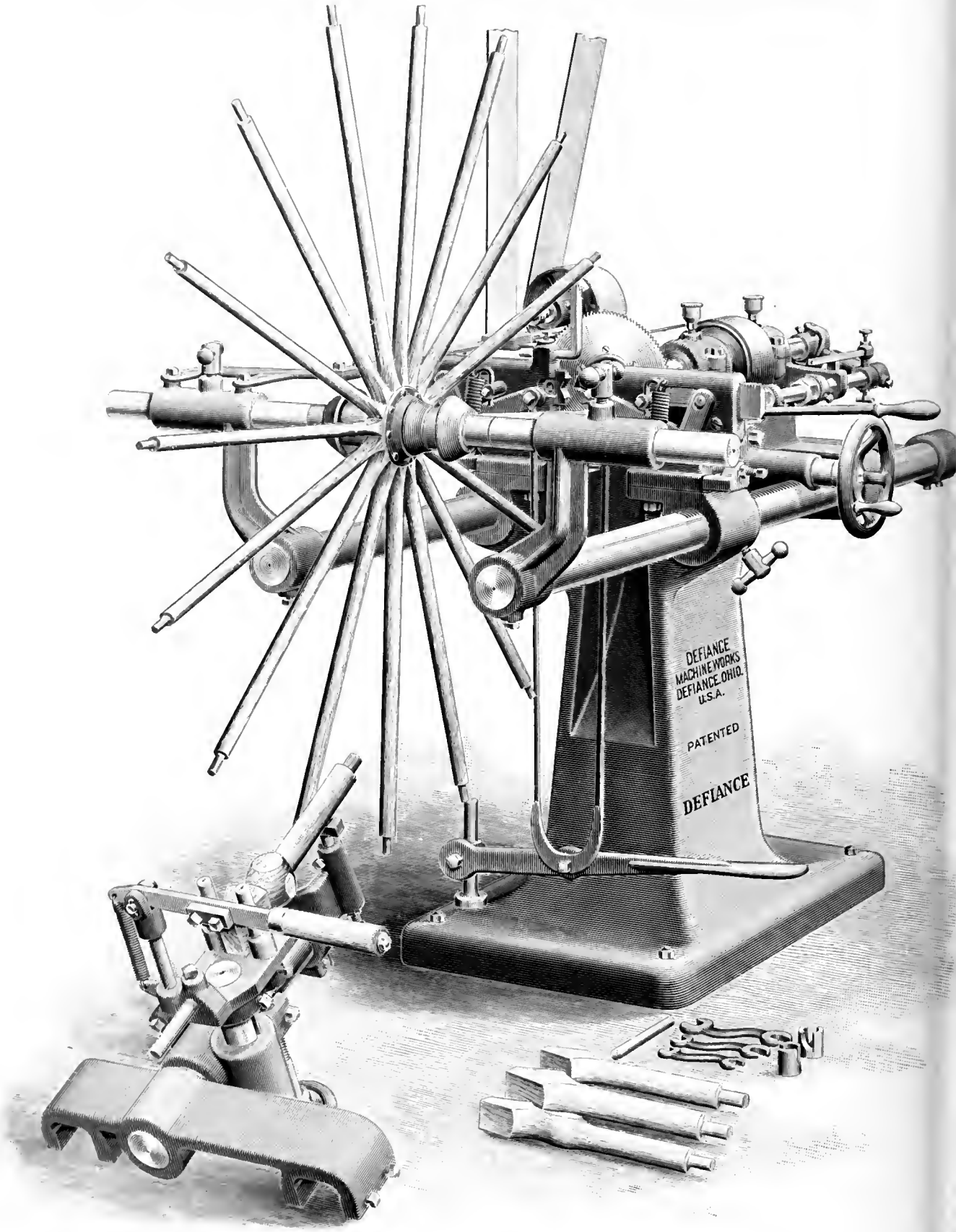
THE GRADUATION OF THE BLOWS is so quickly accomplished that the stroke of the hammer can be changed after the hammer is started by changing the pressure of the foot upon the pedal.

THE ADJUSTABLE GAUGE is conveniently arranged to guide the spoke being driven, to exact position, returning out of the way when not in use. A dish staff is also furnished to test the work.

THE HAMMER HELVE is attached to the machine by a friction binder, and it is easily removed when desired. The hammer is made of solid Swedes iron.

THE FRICTION DRIVER is 18″ × 5″, driven by a single 5″ belt 250 rotations per minute, and it can be belted to from above, below, or either side direct from the main line shaft.

HORSE POWER to drive, 1; floor space occupied, 45″ × 75″.



No. 1 Patent Combination Wheel and Spoke Tenoning Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 44 Feet.

No. 1 Patent Combination Wheel and Spoke Tenoning Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,100 Pounds.

Cubic Measurement, 44 Feet.

Cable Word, TEUTI.

THIS No. 1 PATENT COMBINATION WHEEL AND SPOKE TENONING MACHINE, as shown by engraving, is used for cutting off the tenon end of spokes to equal lengths after they are driven into the hub, forming the diameter of the wheel and cutting tenons thereon of various sizes and lengths, finishing the ends of the spokes complete ready to receive the felloe, and by the use of a special attachment shown on the floor, automobile and artillery spokes can be accurately tenoned at the felloe end. This attachment simply clamps over the parallel bars and it is instantly ready for use without disconnecting any of the parts of the machine. It is used by the leading wheel and vehicle builders. It performs the work at a great saving and more perfectly than by any other method. It is adapted to cut tenons with our No. 1 Acme Patent Cutter Head from ⅜″ to 1″ diameter and by the use of our No. 2 Head from ⅝″ to 1 3/16″ diameter in various lengths, or by the use of special heads larger tenons can be cut.

THE FRAME, of neat design, is cast in one piece with cored center and a wide floor space to stand firm.

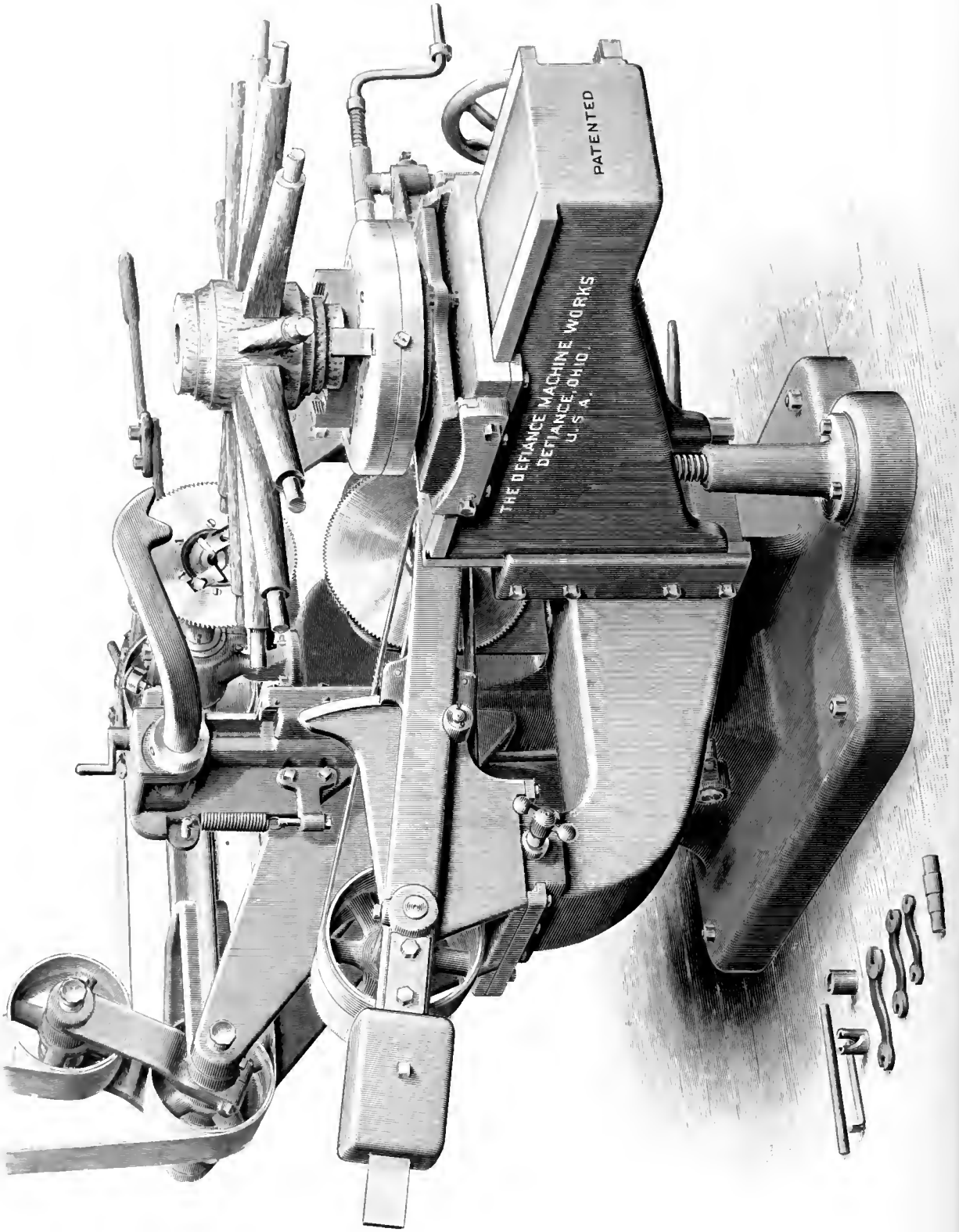
THE CUTTER HEAD SPINDLE, of hammered steel, slides through, and it is feathered to a long sleeve which rotates in bronze bearings. Thus the rotating and the sliding movements of the spindle are in separate bearings, reducing the wear to a minimum. A convenient hand lever is used to move the spindle to or from the work, and suitable stops are provided to regulate the length of tenons.

THE ACME PATENT CUTTER HEAD is fitted with a concave saw to cut off the ends of the spokes to reduce the wheel to its proper diameter and it contains two flat tool steel cutters which are adjustable for cutting tenons of various sizes.

THE WHEEL is held by its hub between taper cups. The cup spindles are adjustable for hubs of different lengths and sizes and to center the wheel with the cutter head. The parallel bars supporting the cup spindles are connected together at the rear end and they slide through heavy bearings cast to the main frame. They are adjustable horizontally by a convenient hand wheel to regulate the diameter of wheel to be tenoned. A scale laid off in inches and fractions is provided to determine the exact diameter of the wheel without any guess work on the part of the operator. The wheel to be tenoned is revolved over the saw and reduced to its proper diameter, after which the spokes are gripped between V-shaped jaws which are opened and closed by a foot treadle bringing any size spoke to the center of the knives, the operator having both hands free to move the cutter head and handle the wheel.

THE COUNTER is furnished as follows: Shaft, 1 1/16″ × 42″; two No. 2 ball and socket adjustable drop hangers; one driving pulley, 24″ × 4¼″; tight and loose pulleys, 10″ × 5″; speed, 625 rotations per minute. It can be belted to from above, below, or either side.

HORSE POWER to drive, 2; floor space occupied, 36″ × 75″.



No. 2 Patent Heavy Wheel Tenoning and Cut-Off Machine.

No. 2 Patent Heavy Wheel Tenoning and Cut-Off Machine.

Export Shipping Weight, 3,000 Pounds.
Net Weight, 2,400 Pounds.
Cubic Measurement, 105 Feet.
Cable Word, TULUO.

THIS ENGRAVING represents our No. 2 Patent Heavy Wheel Tenoning and Cut-Off Machine, which has been designed especially to meet the requirements of automobile, wagon, heavy truck, and artillery wheel builders. It is used for cutting off the tread end of the spokes to equal length, reducing the wheel to the proper diameter and cutting tenons thereon, finishing the end of the spokes complete ready to receive the felloe, making tenons from the smallest to the very largest and heaviest sizes.

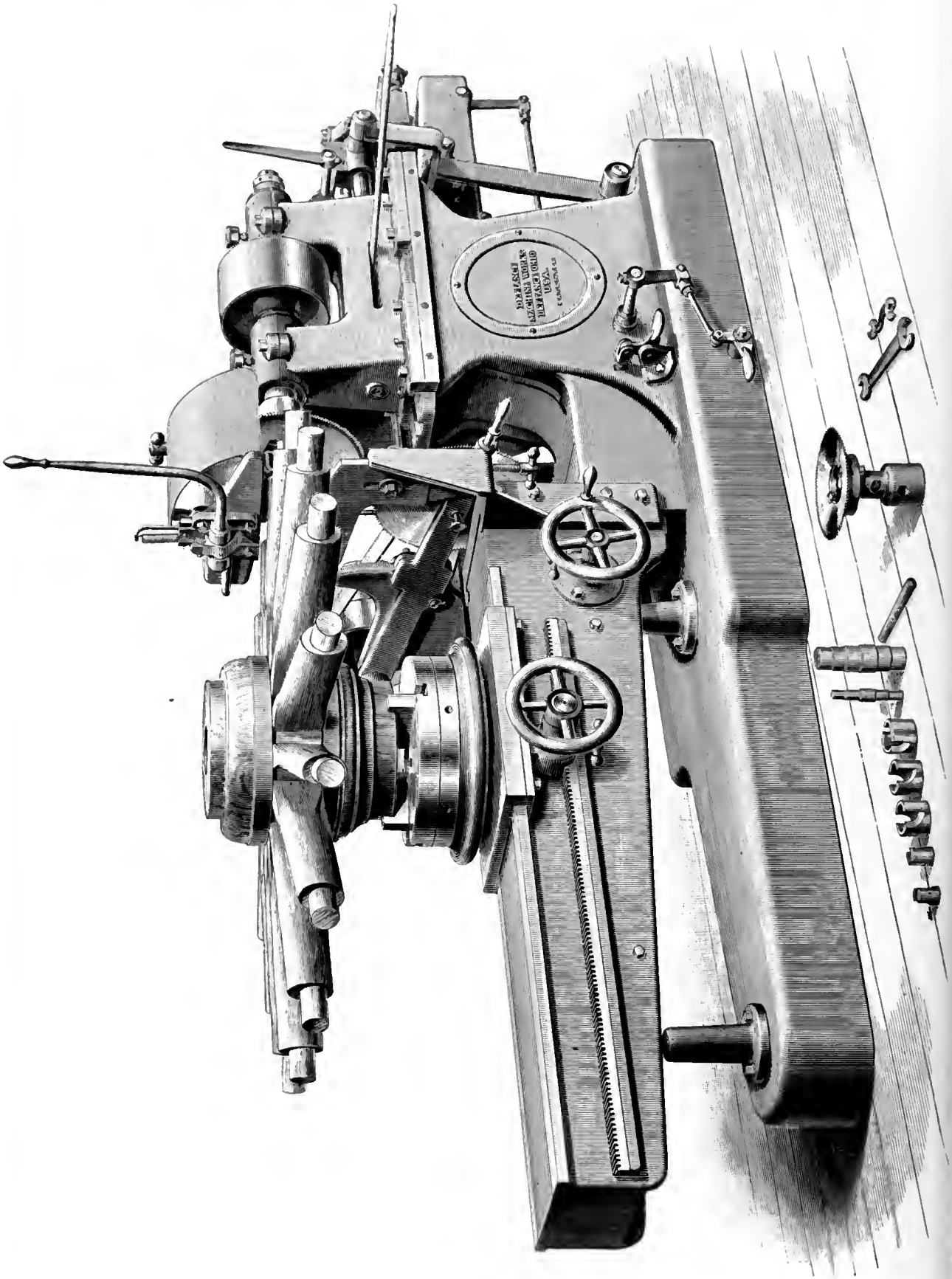
THE FRAME, of neat design, is heavy and substantial, with cored center and a broad floor base, with all the working parts accurately fitted to it.

THE TENONING SPINDLE, of ground steel, large in diameter, runs in self-lubricating bronze bearings. It is fitted with our Acme Patent Adjustable Cutter Head, which is provided with cutters that can be quickly adjusted for making tenons of different diameters. The hand lever for operating the same is provided with stops to regulate the length of tenon, and they are equipped with screw adjustments for accurately securing a slight variation in the length of cut. The frame supporting the cutter head spindle is hinged to the rear side of the main frame of the machine, so that it can be easily and quickly lifted up out of the way and held in that position while the auxiliary saw is being used, which is also hinged to the rear side of the machine; and it is brought up to the spoke for cutting off the first spoke to be tenoned on low, heavy wheels having spokes so close together that the concave saw will not enter between them. After the auxiliary saw performs its work it drops down out of the way, and the concave saw attached to the cutter head takes its place and performs the balance of the work. The auxiliary saw is only used on special low wheels.

THE WHEEL to be tenoned is held in a three-jawed universal chuck, which can be quickly opened or closed, and it is mounted upon an adjustable table which can be adjusted vertically to regulate the position of the tenon with the spoke; it has also a horizontal adjustment for wheels of different diameter. The wheel is placed into the machine, as shown, and revolved over the saw, which reduces it to the proper diameter, and when the tenons are being cut the spoke is held at the tread end between a V-shaped jaw, which is brought down to its work by a convenient foot treadle. It holds the spoke firmly and central with the cutter head, which is then brought forward to its work by a hand lever. The stops on the guide bar regulate to a nicety the length of tenon desired. By this design the operator has both his hands free to move the cutter head and revolve the wheel.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}'' \times 60''$ long; two No. 1 adjustable drop hangers; one driving pulley, $30'' \times 5^{1}/_{4}''$; one pulley for auxiliary saw, $10'' \times 3^{1}/_{4}''$; one pair of tight and loose pulleys, $12'' \times 6''$. Speed, 720 revolutions per minute.

HORSE POWER to drive, 3; floor space occupied, $50'' \times 75''$.


THE DEFIANCE MACHINE WORKS
DEFIANCE OHIO
U.S.A.

No. 3 Patent Automatic Heavy Wheel Tenoning and Cut-Off Machine.

Export Shipping Weight, 5,800 Pounds.

Net Weight, 4,800 Pounds.

Cubic Measurement, 199 Feet.

Cable Word, TONAWANDA.

THIS ENGRAVING represents our No. 3 Patent Automatic Heavy Wheel Tenoning and Cut-Off Machine, which has been designed to meet the requirements of wagon, heavy truck, and artillery wheel builders. It is used for cutting off the tread end of spokes, reducing the wheel to the proper diameter and cutting the tenons complete ready to receive the felloes on wheels either light, medium, or extremely heavy, cutting tenons as large as 2″ diameter in different lengths.

IT BEING AUTOMATIC in its operation, requires no heavy labor on the part of the operator. The cutter head is brought up to its work by power feed. A slight pressure of the operator's foot upon the pedal at the base of the machine brings the cutter head forward, which, after finishing the tenon, quickly returns ready for the next spoke, and so continuing until the work is finished. Fully fifty per cent. in time is saved in using this machine over hand feed machines, and the tenons are cut cleaner and more exact to size on account of the cut being uniform, which also increases the life of the cutters.

THE FRAME is a heavy casting of neat design, cast in one piece, making it very substantial, and provided with a broad floor base to stand firm.

THE ACME PATENT CUTTER HEAD used is fitted with a concave saw for sawing off the spokes, and it is provided with adjustable cutters which can be set for cutting tenons of small or large diameters. The spindle of steel, which supports the cutter head, large in diameter, runs in heavy self-lubricating bearings, and the head stock to which it is attached is gibbed to the top of the frame, and it travels in a horizontal plane to and from the work by an automatic feed, with a quick return movement, having an air or pneumatic cushion fitted to the rear end to prevent shock or jar on the return movement. An ingenious device is employed for quickly moving the entire head stock back out of the way beyond its regular stroke when using the auxiliary saw.

THE AUXILIARY SAW is located immediately under the cutter head, and it is used for cutting off the end of the first spoke to be tenoned, on wheels of small diameter where the spokes are so close together that the concave saw will not enter between them. Previous to this invention this operation was accomplished by hand labor.

THE WHEEL is held in a three-jawed universal chuck which is opened and closed by a large hand-wheel. The chuck is mounted upon a saddle which is gibbed to the table, and it can be quickly moved by a convenient hand-wheel, the desired distance from the cutter head for wheels of different diameter. The table is provided with a vertical movement to regulate the position of the tenon with the spoke.

IN OPERATING, the wheel is placed into the machine, as shown, and first reduced to its proper diameter by revolving it against the saw, and when the tenons are being cut the spoke is firmly held between a V-shaped jaw which is opened and closed by a convenient hand lever which holds the spoke securely and central with the cutter head. The construction of this device is such that the spoke is gauged from the face side. The entire spoke clamping device is automatically lifted up out of the way by touching the upper foot pedal at the base of the machine, when placing a wheel in or taking it out of the machine, thus giving free access and causing no delay.

THE COUNTER is furnished complete, as follows: Shaft, $2\frac{3}{16}'' \times 10$ feet 6″; three No. 3 ball and socket adjustable drop hangers with boxes $9\frac{1}{4}''$ long; two pair of tight and loose pulleys $12'' \times 8''$, speed of one pair 940, speed of the other pair 700 turns per minute, giving 2,400 and 1,800 turns per minute to the cutter head for small and large work; two $26'' \times 9''$ straight faced driving pulleys for driving cutter head; one $10'' \times 10''$ straight faced driving pulley for driving auxiliary cut-off saw; one three-step cone pulley for driving feed, giving three changes of speed.

HORSE POWER to drive, 3; floor space occupied, $44'' \times 114''$.

No. 1 Wheel Rimming and Finishing Stand.

Export Shipping Weight, 300 Pounds.
Net Weight, 200 Pounds.
Cubic Measurement, 12 Feet.
Cable Word, RELAY.

No. 1 Wheel Rimming and Finishing Stand.

Export Shipping Weight, 300 Pounds.
Net Weight, 200 Pounds.
Cubic Measurement, 12 Feet.
Cable Word, RELAY.

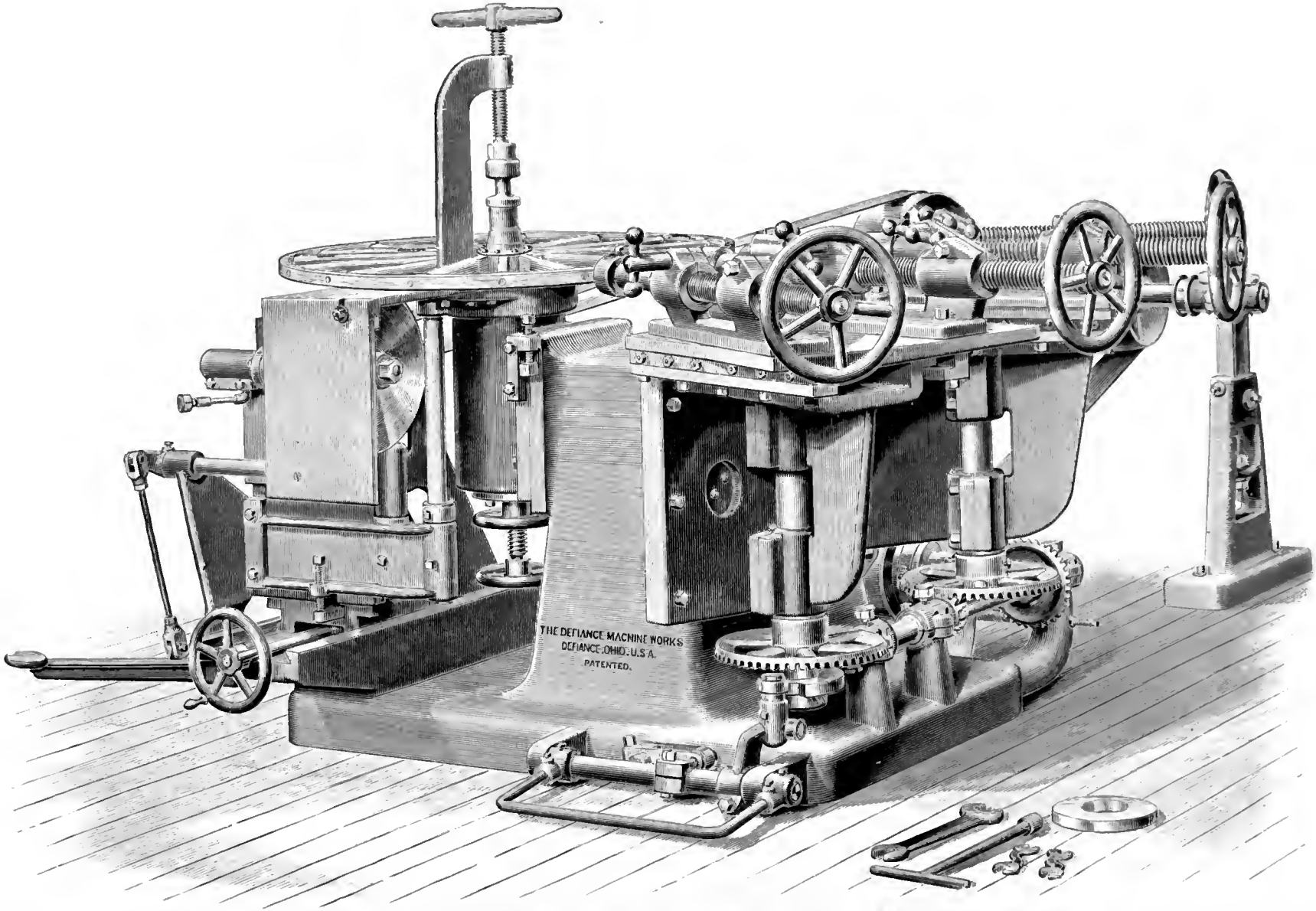
THIS ENGRAVING represents our improved No. 1 Wheel Rimming and Finishing Stand especially intended for the use of vehicle wheel builders to securely hold the wheel in a horizontal position while the felloe is being fitted thereon, and the finishing performed.

IT IS built either 30″ or 32″ high, as ordered. The frame is cast in one piece with cored center. It is strong and durable, very neat in appearance, and occupies a small amount of floor space, and it is the most convenient machine that can be employed for this purpose.

THE GOOSE NECK, of wrought iron, is provided with a vertical adjustment on the frame to accommodate hubs of different lengths, up to 10½″ long. A greater adjustment can be furnished without extra cost when the machine is so ordered. The clamping screw, of steel, is heavy and strong, and fitted with a handle as shown by the engraving, or a straight, double ended handle, as desired.

THE WHEEL rests upon a true surface on top of the frame with the goose neck between the spokes, and is rigidly held in position by the screw clamp. The wheel can be placed in or removed from the machine without disconnecting any of its parts.

FLOOR SPACE occupied, 60″.



No. 2 Patent Automatic Wheel Rimming Machine.

Export Shipping Weight, 5,700 Pounds.
Net Weight, 5,000 Pounds.
Cubic Measurement, 133 Feet.
Cable Word, RUTLAND.

No. 2 Patent Automatic Wheel Rimming Machine.

Export Shipping Weight, 5,700 Pounds.

Net Weight, 5,000 Pounds.

Cubic Measurement, 133 Feet.

Cable Word, RUTLAND.

THIS ENGRAVING represents our No. 2 Patent Automatic Wheel Rimming Machine, designed for the use of vehicle wheel builders, for the purpose of automatically placing the rim or felloe on to the wheel. It is the first successful attempt to do this class of work by machinery, and it has proven to be one of the greatest labor-saving devices that has so far been invented for wheel making. Previous to the introduction of this machine, this work was accomplished entirely by hand labor, by the use of a hammer in the hands of a skillful and expensive man, which proved a slow and costly method, and many rims so driven were checked or split by reason of violent and uneven pounding. By this new machine and a cheap operator, no rims are split, and more than double the capacity is secured over the most expert hand rimmer.

THE FRAME of this machine is a massive casting in one piece, with cored center and a wide floor base to stand firm, with all the working parts accurately fitted to it.

THE WHEEL CHUCK is supported upon substantial bearings, and it turns with the greatest ease. It is provided with a vertical adjustment to center the wheel with the plungers, and a convenient screw clamp to hold the wheel in position.

THE FOUR PLUNGERS, which drive the rim on to the wheel's tenons, are fitted to heavy saddles which are gibbed to and slide horizontally on top of the main frame. The power to operate them is communicated through a friction clutch and cut gearing, each plunger being provided with an independent screw adjustment to accommodate wheels of different diameters, and also to secure the correct relative position of each plunger to its work, the first plunger acting as a starter, it being set the proper distance from the wheel to simply start the rim on the tenon, each succeeding plunger leading in closer to the wheel, so that the fourth or last plunger will drive the rim tightly home against the shoulder of the tenon. After a tenon has been once entered into the tenon hole in the rim, no further attention on the part of the operator is necessary, excepting to turn the wheel, one single rotation completing the work, the fourth plunger always driving the rim to its proper position.

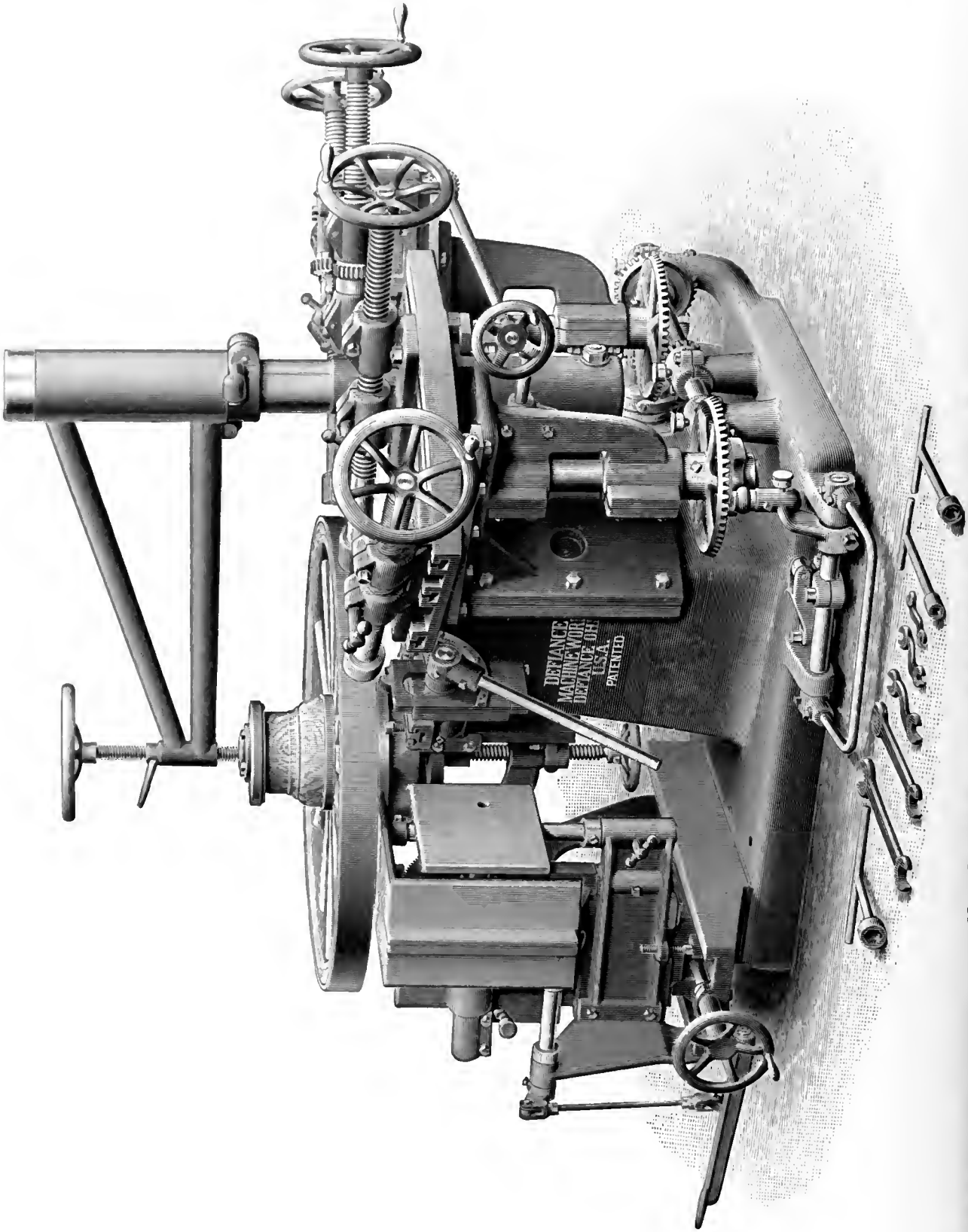
THE CUT-OFF SAW used for cutting off the ends of the rim to form the joints is gibbed to an upright standard underneath the wheel out of harm's way, and it is instantly brought up to its work by a slight touch of the operator's foot upon a convenient treadle, and it is self-returning when the pressure of the foot is released. The saw is also provided with a horizontal adjustment by hand wheel and screw for wheels of different sizes.

THIS MACHINE is noiseless in its operation, all the plungers acting simultaneously, and they produce a smooth and uniform pressure upon the work, entirely overcoming the liability of injuring the wheel. The operator has instant control over the machine from the working side, starting or stopping the motion of the plungers at will.

THE CAPACITY of this machine, with an inexpensive operator, is sufficient to rim and cut the joints complete on 100 sets of carriage wheels in ten hours, and better work is secured than by the old method.

THE COUNTER is furnished as follows: Shaft, $1\frac{5}{8}''\times50''$; two ball and socket floor stands, 30″ high; one driving pulley, $20''\times4''$, for driving the saw; one driving pulley, $10''\times4''$, for driving the plungers; one special belt tightener for the saw belt; one pair of tight and loose pulleys, $12''\times6''$; speed, 500 rotations per minute.

HORSE POWER to drive, 2; floor space occupied, $84''\times120''$.



No. 3 Patent Automatic Wheel Rimming Machine.

No. 3 Patent Automatic Wheel Rimming Machine.

Export Shipping Weight, 5,800 Pounds.
Net Weight, 5,200 Pounds.
Cubic Measurement, 133 Feet.
Cable Word, RAMBLER.

THIS ENGRAVING represents our No. 3 Patent Automatic Wheel Rimming Machine, designed for the use of automobile, carriage, artillery, and wagon wheel builders, for the purpose of automatically placing the rim or felloe on the wheel.

IT WILL handle wheels up to 54″ diameter and smaller, with hubs as large as 10¼″ diameter and under, successfully handling either sawed or bent felloes.

PREVIOUS TO ITS INTRODUCTION this work was accomplished entirely by hand labor, but the saving effected by the use of this new machine has proven so large that it has been universally adopted by all the principal vehicle wheel builders, and it is recognized as one of the greatest labor saving devices so far invented for the wheel maker.

THE OLD METHOD of driving the felloes on to the spokes by hand not only proved expensive, because of this slow process, but it required the services of a skillful workman, and at best many of the felloes would be split and the tenons fractured by reason of violent and uneven pounding.

BY THIS MODERN MACHINE over three times more work of a better quality is secured with an inexpensive boy to handle it, and the splitting of felloes and the breaking of tenons is entirely eliminated, and much neater work produced without the sound of a hammer.

THE FRAME of neat design is cast in one piece, with cored center and a broad floor base.

THE WHEEL to be rimmed is held in a circular rotary chuck, which turns with the greatest ease, and it is provided with all the necessary adjustments to center the wheel with the plungers. A convenient swinging clamp firmly holds the wheel in position, and it can be quickly swung out of the way when placing in or taking out the finished product.

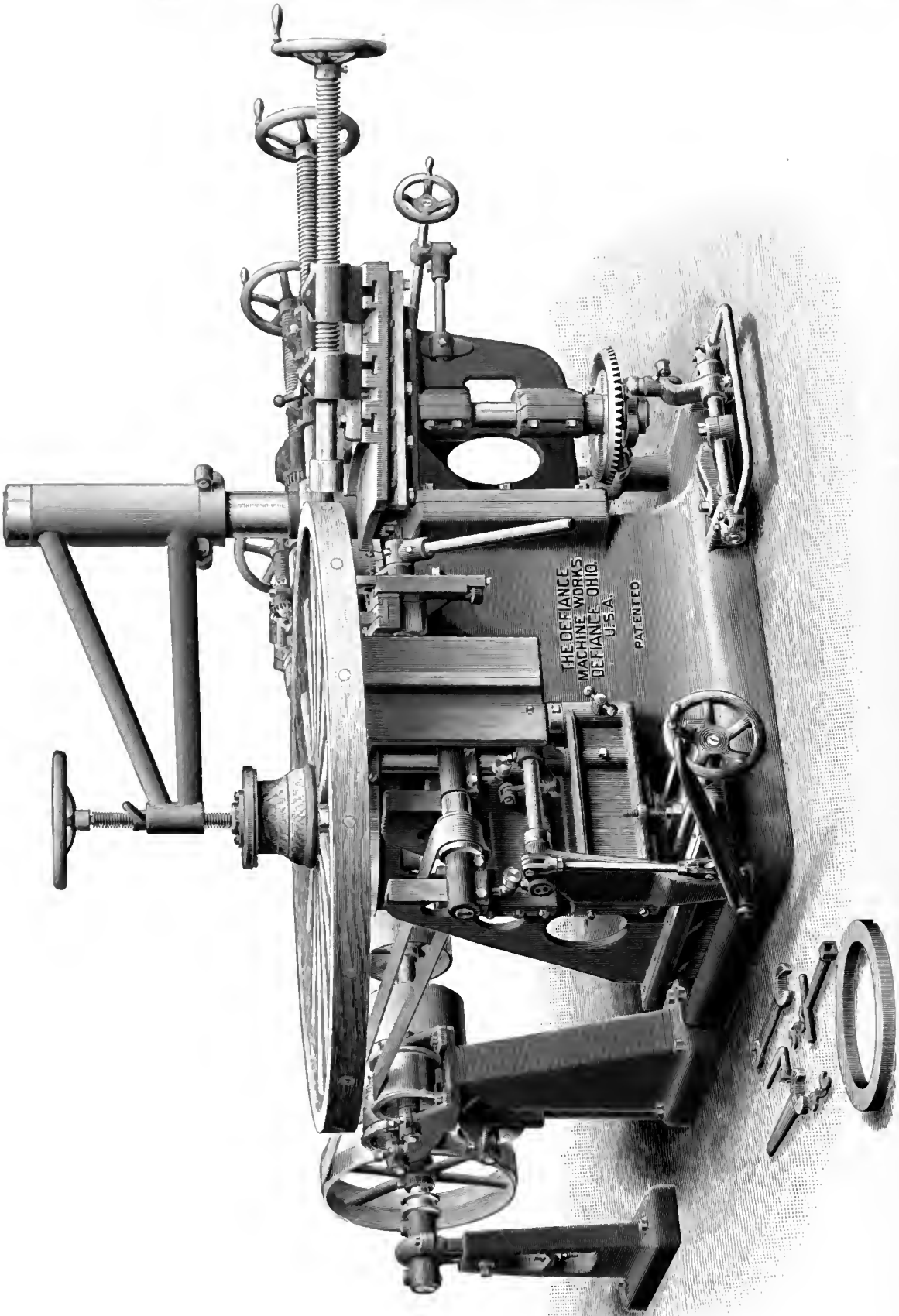
THE FOUR PLUNGERS are fitted to heavy saddles on top of the frame, and they are thoroughly gibbed to it. They are powerfully geared and driven in a horizontal plane similar to the motion of an engine piston, and they are adjustable to or from each other, or to and from the wheel to accommodate wheels of different sizes. The first plunger simply starts the felloe on the tenon, each succeeding plunger is set in closer to the wheel, the last or fourth plunger driving the felloe tight up against the shoulder of the tenon. It is only necessary for the operator to start the tenon into the first hole in the felloe and turn the wheel, which is completed at a single rotation.

THE SPOKE GRIPPING DEVICE is an ingenious arrangement, and it is used to pull the spokes in proper position to suit the location of the tenon holes in the felloes.

THE CUT-OFF SAW for forming the joints at the ends of the felloe has a vertical movement by foot treadle, and it can be instantly brought up to its work or down out of the way when not in use.

THE COUNTER is furnished as follows: Shaft, 1 15/16″ × 50″; two self-lubricating floor stands, 30″ high; one driving pulley, 20″ × 4″, for cut-off saw; one driving pulley, 10″ × 4″, for driving the plungers; one special belt tightener. The tight and loose pulleys are 12″ diameter, 6″ face, and should run 500 revolutions per minute.

HORSE POWER to drive, 2; floor space occupied, 84″ × 120″.



No. 4 Patent Automatic Wheel Rimming Machine.

Export Shipping Weight, 6,100 Pounds.
Net Weight, 5,400 Pounds.
Cubic Measurement, 133 Feet.
Cable Word, RONCO.

No. 4 Patent Automatic Wheel Rimming Machine.

Export Shipping Weight, 6,100 Pounds.

Net Weight, 5,400 Pounds.

Cubic Measurement, 133 Feet.

Cable Word, RONCO.

THIS ENGRAVING represents our No. 4 Patent Automatic Wheel Rimming Machine, which is the largest and most powerful type of machine built for this work. It was especially designed to meet the requirements of wagon, truck, and artillery wheel builders for automatically placing the rim or felloe on the wheel.

ITS CAPACITY is sufficient to handle wheels up to 54″ diameter and under, with hubs up to 12¼″ diameter and smaller, putting on successfully either sawed or bent felloes in narrow or wide sizes. With an inexpensive operator it will do three times more work and of a better quality than by the old method.

THIS WORK previous to the introduction of this machine was performed entirely by hand labor, which proved slow and expensive, requiring the services of a skillful workman, who would at best split many of the felloes and fracture the tenons by uneven pounding. By this new method the work is accomplished entirely free from noise and without injury to either the felloes or tenons.

THE FRAME is a heavy casting in one piece, with cored center and a broad floor base to stand firm, with all the working parts carefully fitted to it.

THE WHEEL to be rimmed is held in a circular rotary chuck, which turns with great ease, having the necessary adjustment to center the wheel with the plungers. A convenient swinging clamp firmly holds the wheel in position, and it can be quickly swung out of the way when placing in or taking out the finished product.

THE PLUNGERS are supported upon heavy sliding saddles, which are driven by a powerful friction clutch, and they are adjustable to or from the wheel or to and from each other for wheels of different sizes. They travel in unison in a horizontal plane. The first one nearest the operator simply starts the felloe on the tenon, each succeeding plunger is set in closer to the wheel, the last or fourth plunger finishes the work, driving the felloe tight up against the shoulder of the tenon. It is only necessary for the operator to pay attention to the starting of the work at the first plunger, revolve the wheel and saw the joints. The work is finished at a single rotation of the wheel.

THE SPOKE GRIPPING DEVICE is supplied to spring the spokes in position to suit the location of the tenon holes in the felloes, and when it is not in use it drops down out of the way.

THE SAW for cutting the joints at the ends of the felloes has a vertical movement by foot treadle, and it can be instantly brought up to its work or down out of the way when not in use.

THE COUNTER is furnished as follows: Shaft, 1 15/16″ × 50″ long; two self-lubricating floor stands, 30″ high; one driving pulley, 20″ × 4″, for the cutting-off saw; one driving pulley, 10″ × 4″, for driving the plungers; one special belt tightener. The tight and loose pulleys are 12″ diameter, 6″ face, and should run 500 rotations per minute.

HORSE POWER to drive, 3; floor space occupied, 84″ × 120″.

No. 1 Heavy Sarven Wheel Riveting Stand.

Export Shipping Weight, 300 Pounds.

Net Weight, 200 Pounds.

Cubic Measurement, 10 Feet.

Cable Word, REDSKIN.

No. 1 Heavy Sarven Wheel Riveting Stand.

Export Shipping Weight, 300 Pounds.

Net Weight, 200 Pounds.

Cubic Measurement, 10 Feet.

Cable Word, REDSKIN.

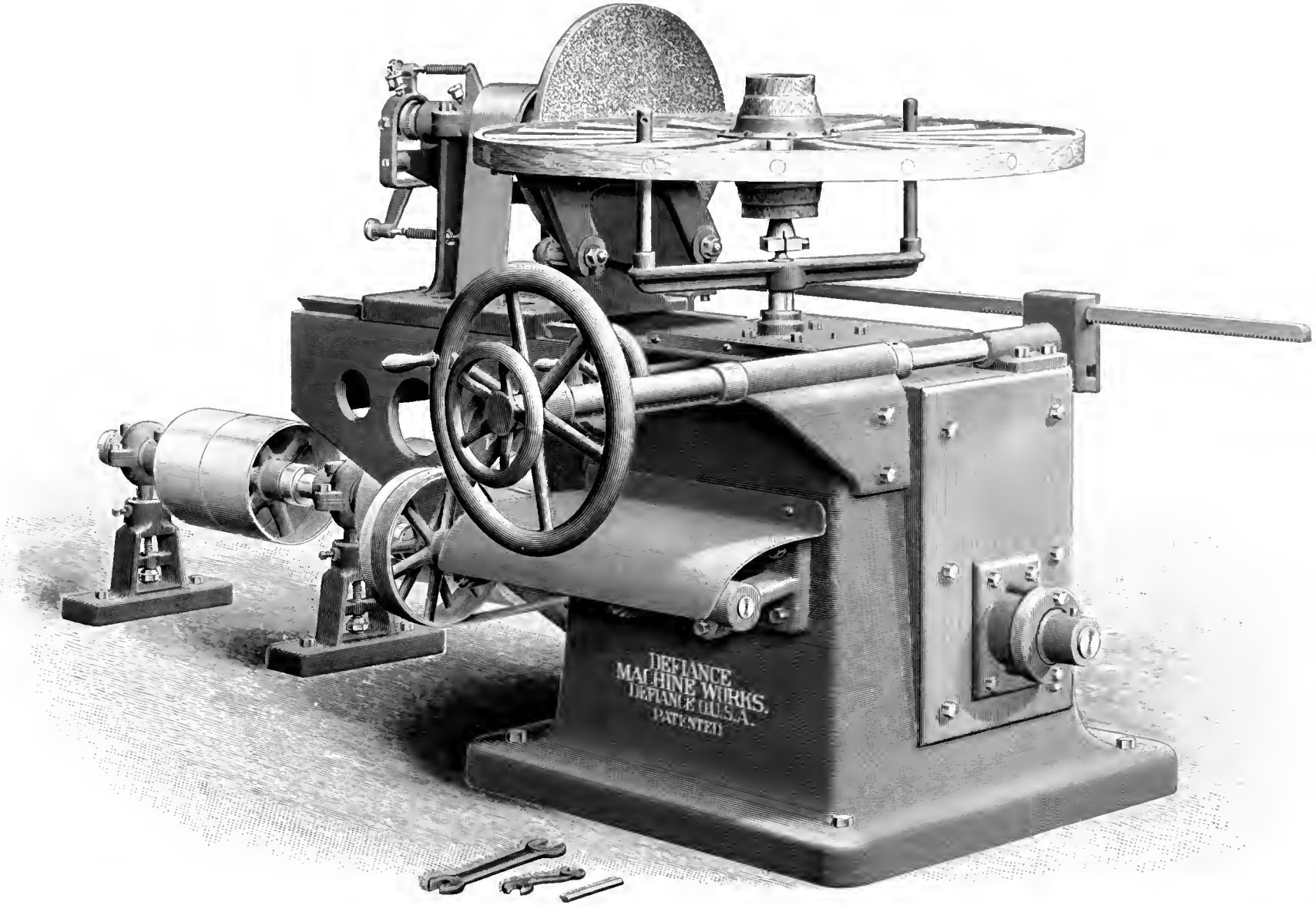
THIS ENGRAVING represents our No. 1 Heavy Sarven Wheel Riveting Stand, which has been designed for the use of vehicle wheel builders for setting the rivets in Sarven wheel flanges. Its capacity is sufficient to cover from the lightest to the heaviest work, and it is provided with every desired adjustment.

THE FRAME is cast in one piece with cored center with a broad base to stand firm. A tempered steel anvil is mortised into the end of the frame and held in position by a single bolt, so arranged that it can be quickly removed.

THE CLAMPING DEVICE for holding the wheel in position while being operated upon is an ingenious arrangement, and it is very effective, holding the wheel firmly in position by the weight of the operator's foot upon the pedal, and it is self-releasing when the foot is removed. The key at the end of the upright rod is mortised through it, and it can be instantly slipped out to remove the finished wheel.

THIS MACHINE is very neat in design and convenient in every way, and it will pay for itself in any wheel factory in a short time. It is furnished with one suitable hammer and one heading tool.

FLOOR SPACE occupied, 60″.



Model K Vehicle Wheel Tread Sander.

Export Shipping Weight, 3,000 Pounds.
Net Weight, 2,400 Pounds.
Cubic Measurement, 118 Feet.
Cable Word, TRUESDALE.

Model K Vehicle Wheel Tread Sander.

Export Shipping Weight, 3,000 Pounds.

Net Weight, 2,400 Pounds.

Cubic Measurement, 118 Feet.

Cable Word, TRUESDALE.

THIS ENGRAVING represents our Model K Vehicle Wheel Tread Sanding Machine, which is used by makers of vehicle wheels, such as used on automobiles, carriages and wagons, for rapidly and accurately dressing the tread of the wheel's felloe to exact diameter and finishing it ready for the metal band or tire.

IT WILL finish about 600 medium sized wheels in ten hours and larger ones in proportion, accommodating from the smallest to the largest diameters with various widths of felloes, and it can be successfully handled by unskilled labor.

THE FRAME is a heavy casting in one piece with cored center and a wide floor base to stand firm, entirely overcoming jar or vibration.

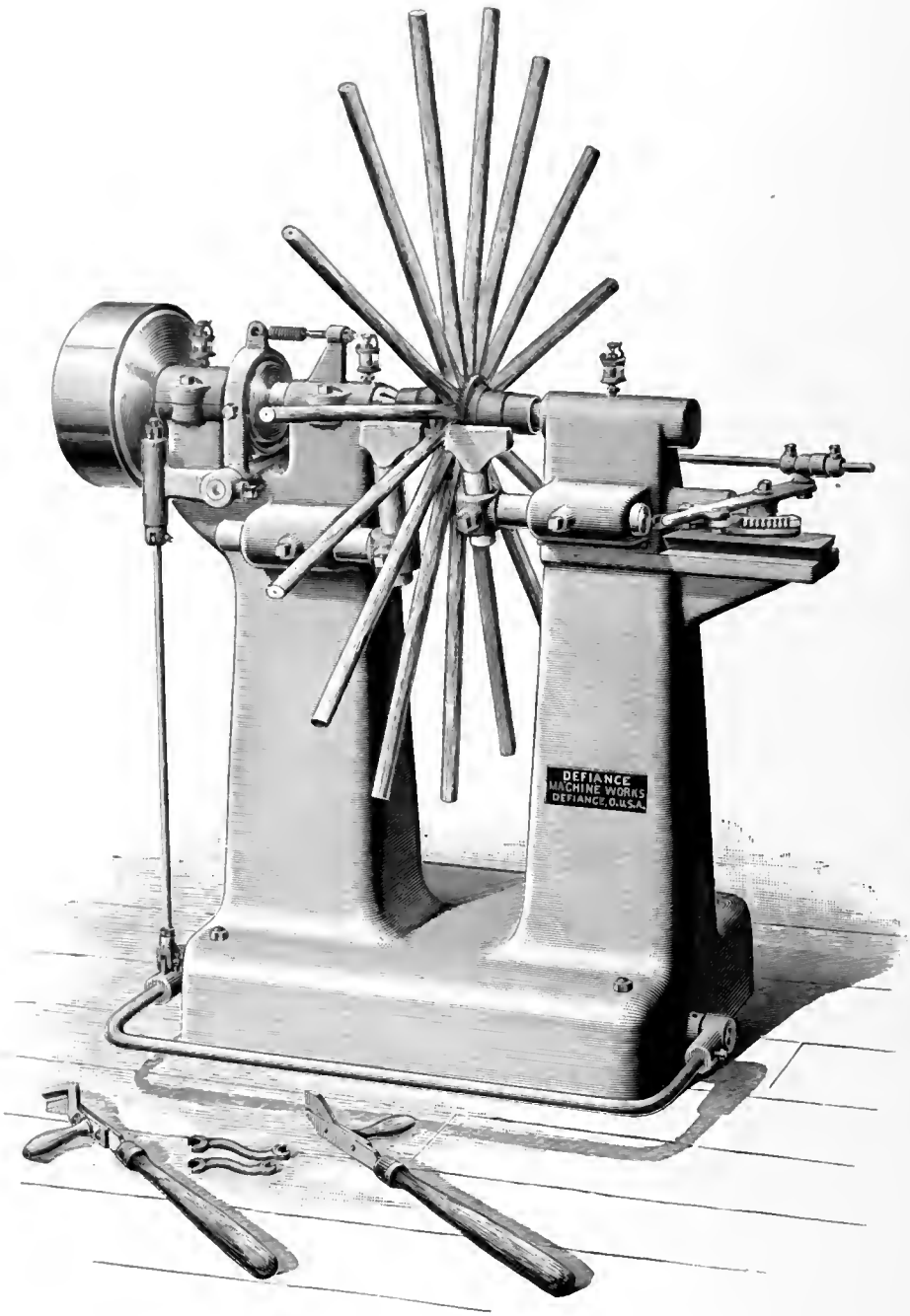
THE SANDPAPER DISC rotates upon a heavy steel arbor running in long self-lubricating bearings so enclosed as to exclude dust or dirt. The sandpaper covers either side of the disc so that both sides can be used by reversing.

THE WHEEL to be finished is placed upon a revolving cone center provided with suitable driving arms to rotate the wheel. The wheel's felloe next to the sand disc rests upon a table. The wheel is then brought in contact with the disc by a slight turn of the large hand wheel shown; when the work is finished by a single rotation of the wheel, smooth and true, entirely free from hand labor, which effects a large saving in time and greatly improves the quality of the work.

THIS MACHINE is supplied with two sand discs, giving four separate cutting surfaces. All the gears are cut from the solid; all the journals are lead lapped, and the sliding surfaces are accurately scraped to a bearing.

THE COUNTERSHAFT is underneath the machine out of harm's way. The tight and loose pulleys are 10″ × 6″, and should rotate 730 turns per minute.

HORSE POWER to drive, 2; floor space occupied, 52″ × 80″.



No. 0 Sarven Wheel Flange Seat Facing Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 42 Feet.

Cable Word, FRISCO.

No. 0 Sarven Wheel Flange Seat Facing Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 42 Feet.

Cable Word, FRISCO.

THIS MACHINE has been designed for the use of wheel makers for facing off the sides of the spokes near the hub, to secure a true bearing for the flanges when pressed on. By this method, the position of the spokes and dish of the wheel are not changed when the flanges are forced up and each spoke is properly supported by the flanges, making a true and substantial job.

THE FRAME is cast in one piece with cored center. It is of neat design and very strong.

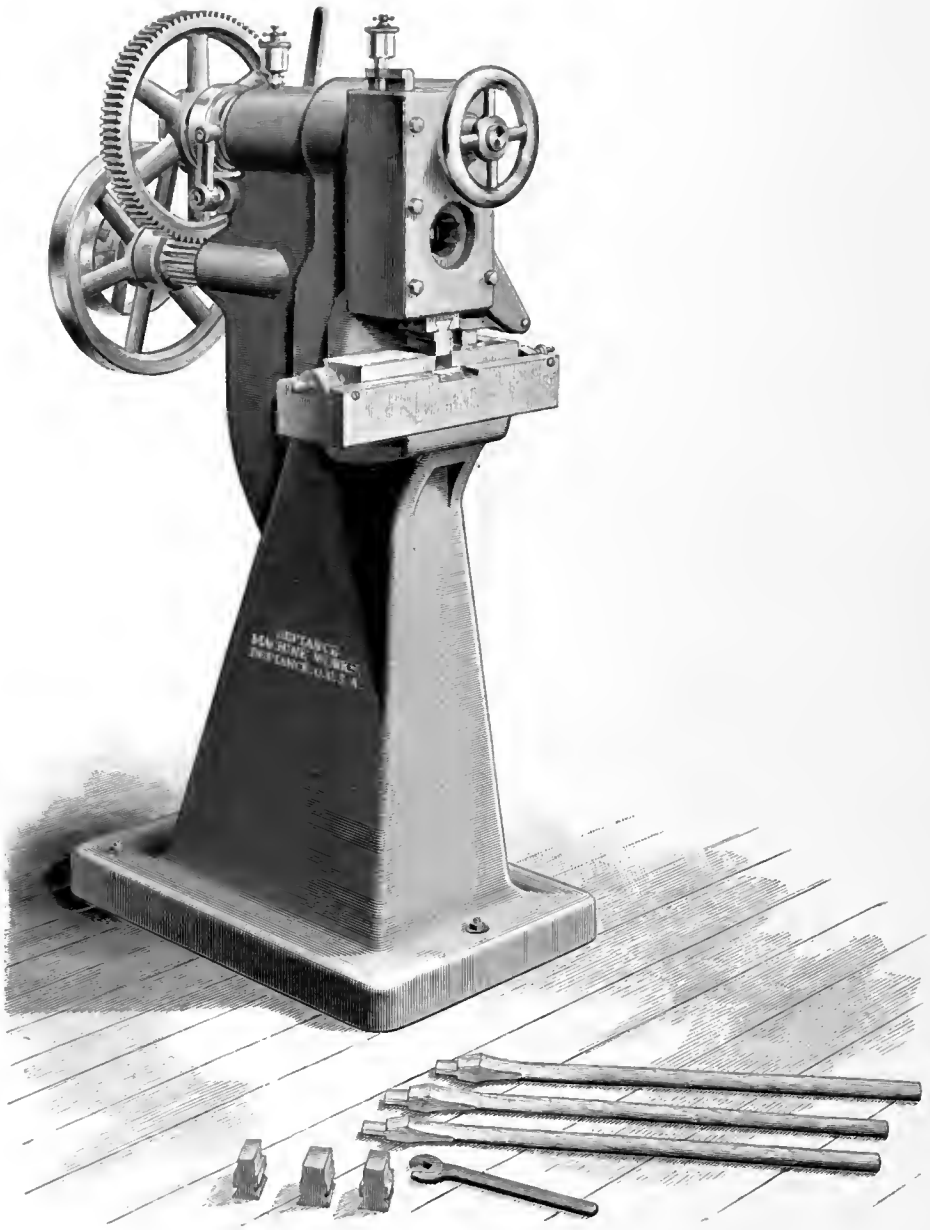
IT IS fitted with quick acting tail stock operated by a ratchet lever. The right hand tool rest is attached to it and moves with the tail stock, so that it is always in proper position, requiring no adjustment when once set for a certain size wheel. Both tool rests can be adjusted in any direction for different sizes of wheels.

A FRICTION PULLEY is used to drive the machine. It is instantly started when the operator's foot is applied to the pedal, which can be reached from either side of the machine. When the pressure is removed from the pedal the momentum of the wheel is immediately checked by an automatic brake.

ITS CAPACITY is sufficient to receive wheels 60″ diameter and smaller with hubs of different diameter up to 14″ long.

THE SPEED of the friction drive pulley is 185 turns per minute, and it has 12″ diameter, 4″ face, requiring a pulley on the main line with 4″ crowning face.

HORSE POWER to drive, 1; floor space occupied, 24″×48″.



No. 0 Spoke Tenon Compress.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 30 Feet.

Cabic Word, COMMAND.

No. 0 Spoke Tenon Compress.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 30 Feet.

Cable Word, COMMAND.

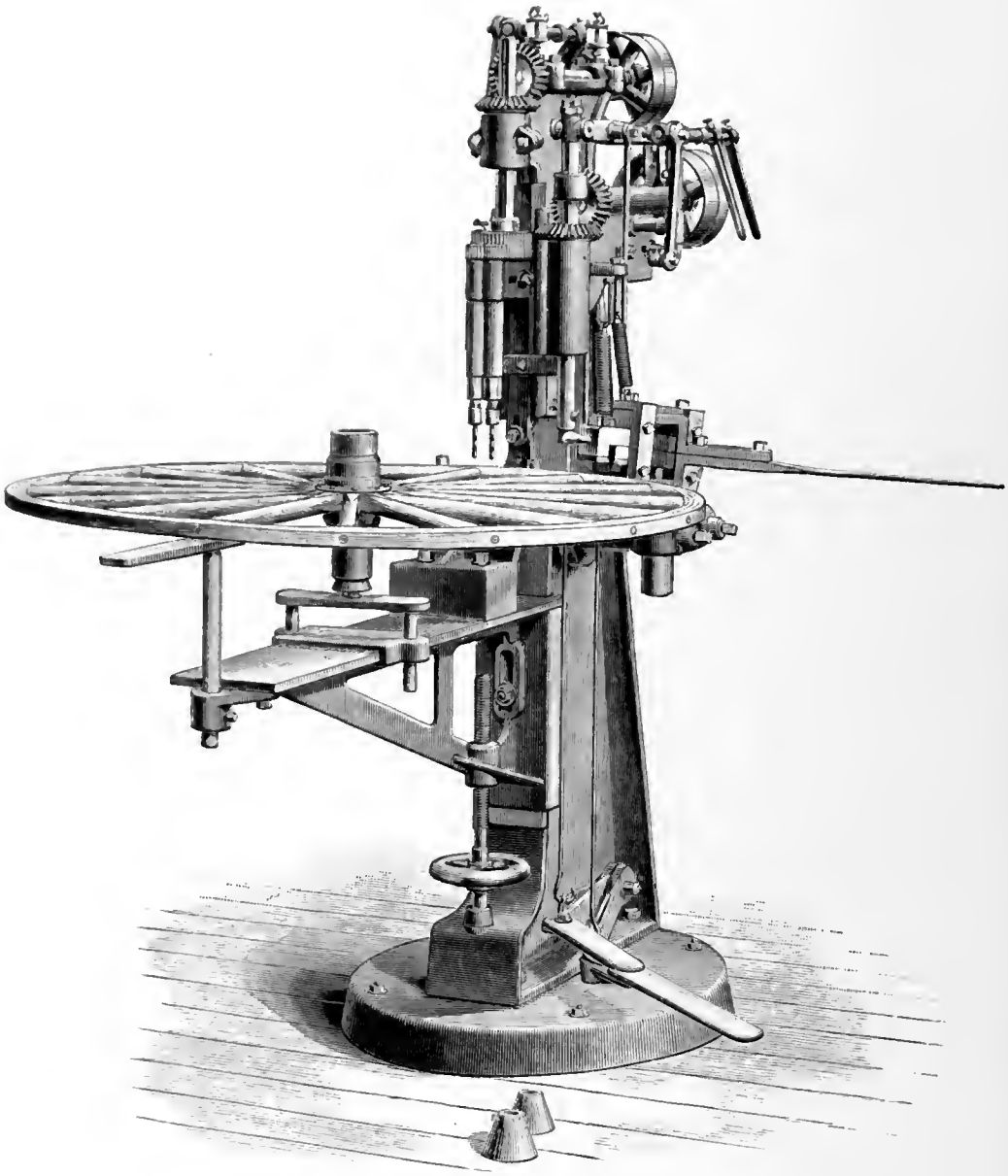
THIS ENGRAVING represents our No. 0 Spoke Tenon Compress, which has been designed for the use of wheel and wagon builders for compressing and corrugating the tenon end of spokes, the object being to press the tenon to exact size to fit the mortise in the hub, make the timber dense and place corrugations crosswise on the four sides of the tenon, which serve to hold the glue and carry it into the mortise as the spoke is being driven into the hub.

THE FRAME is cast in one piece with cored center, and it is provided with a broad base to stand firm. It is strong and durable and will perform its work with the greatest ease.

THE WORKING PARTS are accurately fitted, the gears are cut, main spindles fitted with bronze bushes, ram head scraped to bearing and provided with a taper gib to take up for wear. The die blocks are of tempered steel; all the wearing surfaces are large and durable and the adjustments easily effected. Each machine is furnished with the necessary self-feeding oil cups and wrenches.

THE DRIVING PULLEY is 8″ diameter, 3″ face; speed, 200 rotations per minute, driven direct from main line with pulley 3″ crowning face.

HORSE POWER to drive, ¼; floor space occupied, 24″×48″.



No. 0 Wheel Boring, Screwing, and Cut-Off Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 76 Feet.

Cable Word, BASE.

No. 0 Wheel Boring, Screwing, and Cut-Off Machine.

Export Shipping Weight, 1,200 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 76 Feet.

Cable Word, BASE.

THIS ENGRAVING represents our No. 0 Wheel Boring, Screwing, and Cut-Off Machine which is used by wheel and vehicle builders for boring holes through the wheel's felloe on each side of the spokes, driving the screws therein and cutting off the same close up to the felloe, the object being to prevent the felloe from checking where the spokes enter.

TWO HOLES are bored at one operation and the boring spaced automatically by the spokes, an index which insures uniformity. The driving of the screws into the bored holes is the next operation, which is performed in a most rapid manner, after which the projecting ends of the screws are cut off smooth and even with the surface of the felloe, as fast as the operator can move the lever.

THE FRAME of this machine is cast in one piece with a broad base of neat design and very substantial.

THE TABLE is gibbed to the front of the frame, adjustable vertically by hand wheel and screw to accommodate felloes of different widths. A sliding head is gibbed to the top of the table having a horizontal adjustment for wheels of varying diameters. A cone center to receive the hub is fitted to the sliding head, having a vertical adjustment to hold the wheel parallel with the tables.

THE BORING SPINDLES are arranged side by side upon the front of the frame and they run in adjustable sliding bearings, which can be set to bore holes from 1″ to 2½″ apart, either directly opposite each other or staggering. Each spindle is fitted with a universal chuck for holding drills with shanks from 0 to ¼″. Both spindles are brought down to the work simultaneously by a convenient foot treadle, and they are self-returning.

THE SCREW DRIVING SPINDLE is fitted into substantial bearings, and it is driven with cut gears same as the boring spindles, and it is also connected by foot treadle and is self-returning, and it is capable of driving screws with heads and slots or without.

WHEN IN OPERATION the wheel's hub is placed over the cone center, the felloe resting upon the table underneath the spindles. The wheel is then moved by hand until the spacing dog is reached, when the boring spindles are brought down and both holes are bored. The operation is continued until the boring is completed. The screws are then inserted as rapidly as the operator can move the foot treadle, after which the cutting-off attachment is brought into use, which does its work well and in the shortest time possible. By the use of this triple combination machine several operators are dispensed with and more satisfactory work secured.

THE COUNTER is a portion of the machine. The tight and loose pulleys to drive the boring spindles are 6″ × 2½″; speed, 800 rotations per minute; tight and loose pulleys to drive the screw driving attachment, 6″ × 2½″; speed, 200 rotations per minute. All the pulleys can be belted to from above, below, or either side.

HORSE POWER to drive, 1; floor space occupied, 40″ × 70″.

No. 18 Improved Sarven Wheel Rivet Drilling Machine.

Export Shipping Weight, 700 Pounds.

Net Weight, 525 Pounds.

Cubic Measurement, 18 Feet.

Cable Word, DSHIGO.

No. 18 Improved Sarven Wheel Rivet Drilling Machine.

Export Shipping Weight, 700 Pounds.
Net Weight, 525 Pounds.
Cubic Measurement, 18 Feet.
Cable Word, DSHIGO.

THIS ENGRAVING represents our new No. 18 Improved Sarven Wheel Rivet Drilling Machine, designed for boring the rivet holes around the hub of Sarven wheels. It is entirely self-contained and a most convenient and desirable machine for the wheel shop.

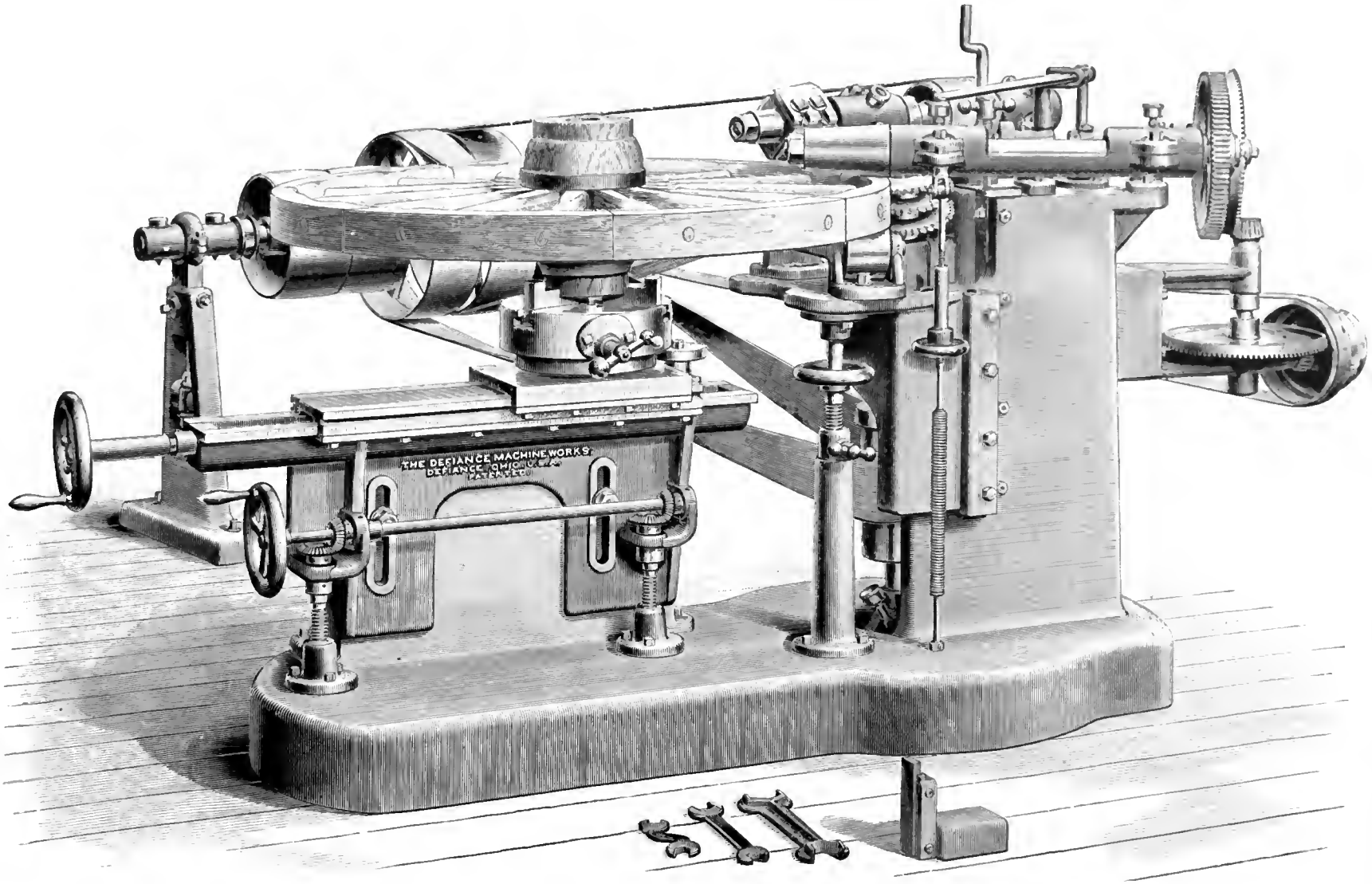
THE FRAME consists of a 2 7/16" ground steel upright shaft securely attached to a heavy cast iron base with the working parts accurately fitted to it.

THE BORING SPINDLE, of ground steel 1⅛" diameter, slides through a splined sleeve which rotates in long self-lubricating bearings. The boring end is hollow to receive a long special boring bit well adapted to this particular class of drilling which cannot be accomplished with an ordinary bit. It has a vertical movement of 8" and it is brought down to its work by a convenient hand lever with a quick return movement by the aid of a coil spring. It is driven by cut miter gears thoroughly encased.

THE WHEEL SUPPORT is true with the boring spindle and provided with a vertical and horizontal adjustment to accommodate wheels of small or large sizes. Its upper edge is turned true, with rounded corners to prevent marring the spokes. Its capacity is sufficient to accommodate wheels up to 60" in diameter or smaller.

THE TIGHT AND LOOSE PULLEYS are 6" diameter, 3" face and they should rotate 2,000 turns per minute. The loose pulley is fitted with bronze and is self-lubricating.

HORSE POWER to drive, ½; floor space occupied, 20" × 48".



No. 1 Patent Automatic Wheel Rim Finishing Machine.

Export Shipping Weight, 4,400 Pounds.
Net Weight, 3,700 Pounds.
Cubic Measurement, 120 Feet.
Cable Word, WHEELMACH.

No. 1 Patent Automatic Wheel Rim Finishing Machine.

Export Shipping Weight, 4,400 Pounds.

Net Weight, 3,700 Pounds.

Cubic Measurement, 120 Feet.

Cable Word, WHEELMACH.

THIS ENGRAVING represents our new No. 1 Patent Automatic Wheel Rim Finishing Machine, which is used by wagon and wheel makers for dressing the tread of the wheel, reducing it to a true diameter with the hub, and planing the sides either straight or beveling. It does the work so smooth that hand labor is entirely avoided. A single rotation of the wheel in this machine completes it, thus effecting an immense saving in time over the old method and accomplishing the work much more perfectly.

IT IS provided with sufficient adjustments to handle either light or heavy wheels, with felloes up to 6″ wide and under, in either small or large diameters up to 8 feet at the largest. It will shape the tread of the wheel to a true circle, or leave the felloes at the joints high on the tread, which some wheel makers prefer, and it finishes the sides of the felloe smooth and true, either parallel or beveling.

THE FRAME, of modern design, is heavy and substantial. It is cast in one piece, with cored center, with closed bottom, making it very stiff, and it is provided with a broad floor base to stand firm.

THE FEED consists of a cone shaped feed-roll having a flexible pressure upon the work, which is driven by cut gearing very steady and powerful, with three changes of speed. It can be instantly started or stopped while the machine is in motion, by a slight movement of a hand lever used for engaging or disengaging the friction clutch. Underneath the cone shaped roll a friction roll is used to allow the wheel to feed through the machine with the greatest ease. The two feed-rolls stand at the proper angle with the wheel to keep the felloe up to the cutters against the gauge used to regulate the depth of cut of the wabble saws.

THE WABBLE SAWS, used for dressing the tread of the wheel, are supported upon a heavy vertical steel spindle running in long self-lubricating bearings, and they are capable of doing smooth work when working with or against the grain of the material.

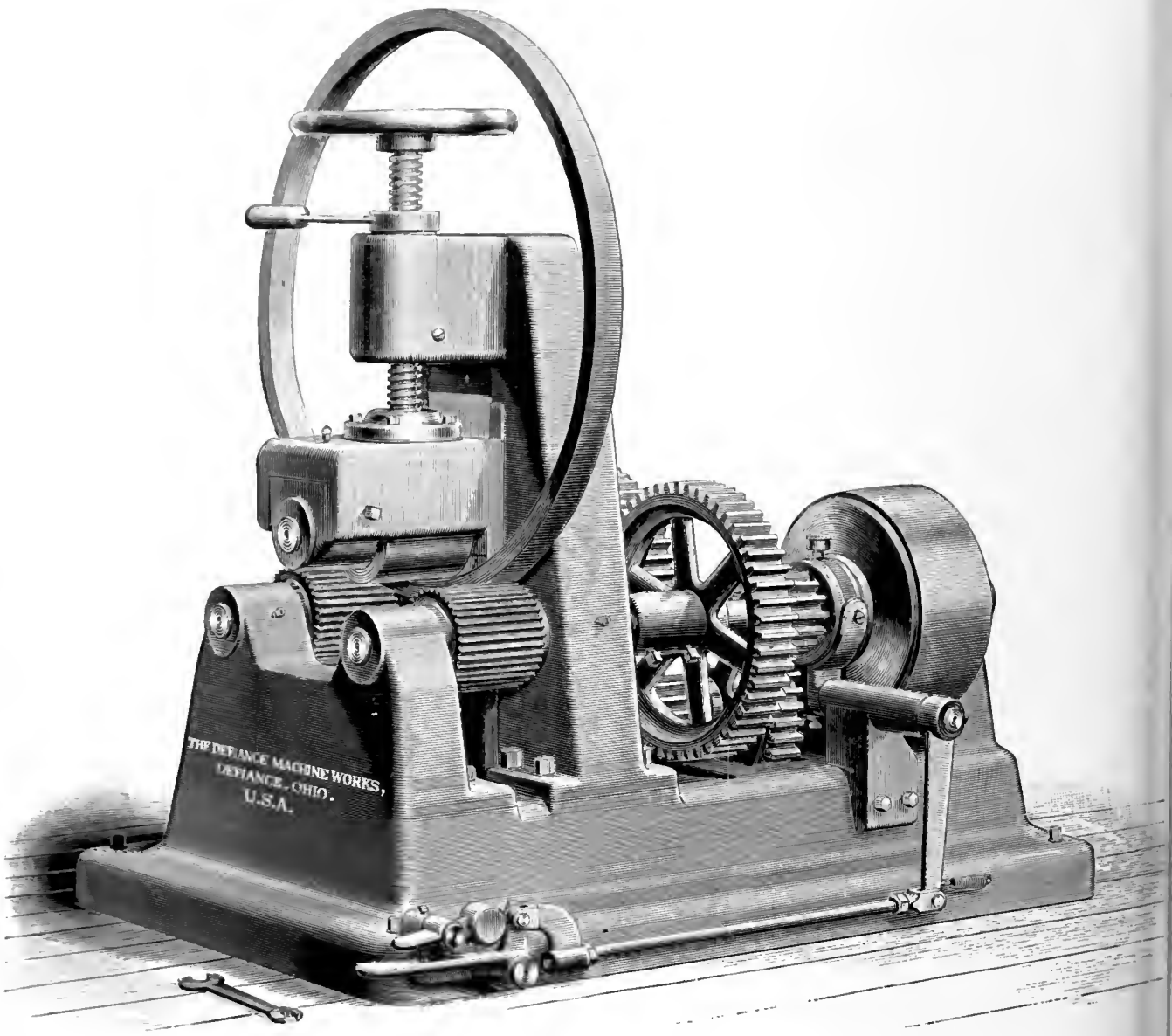
THE CUTTER HEAD used for planing the sides of the felloe can be adjusted to any angle to plane the work straight or beveling, and it is equipped with four cutters provided with chip breakers, to plane and finish the work smooth.

THE CHUCK, in which the hub of the wheel is held, is universal, and the jaws are opened and closed by turning a single screw. It is mounted upon a saddle, which is gibbed to the table, and they are all provided with a vertical adjustment to suit the length of the wheel's hub to bring the felloe to the proper position with the cutters, and a horizontal adjustment for wheels of different sizes. Underneath the chuck a cam is used which rides against a fixed roller. The shape of this cam governs the shape of the tread of the wheel. A round cam will produce a true circle, and for planing high joints a cam with high points is used.

THIS MACHINE is capable of doing a large amount of perfect work with an unskilled operator to handle it, and all the adjustments are of the quickest and simplest kind.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}'' \times 54''$; tight and loose pulleys, $12'' \times 6''$; two driving pulleys, $18'' \times 5''$; two 24″ ball and socket adjustable floor stands; one three-step cone feed pulley; speed of shaft, 1,150 turns per minute.

HORSE POWER to drive, 4; floor space occupied, $85'' \times 96''$.



No. 1 Improved Tire Bending Machine.

Export Shipping Weight, 3,600 Pounds.

Net Weight, 3,100 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, BEJOY.

No. 1 Improved Tire Bending Machine.

Export Shipping Weight, 3,600 Pounds.

Net Weight, 3,100 Pounds.

Cubic Measurement, 93 Feet.

Cable Word, BEJOY.

THIS ENGRAVING represents our No. 1 Improved Tire Bending Machine, which is used for rolling iron and steel tires for vehicle wheels to a true circle. It is capable of taking a straight bar of metal from the very lightest size up to 1½″ thick, 6″ wide at the heaviest, and rolling it from a 30″ circle up to any diameter required. Only one adjustment of the machine is necessary for different circles and sizes of material, that being the raising and lowering of the upper roll.

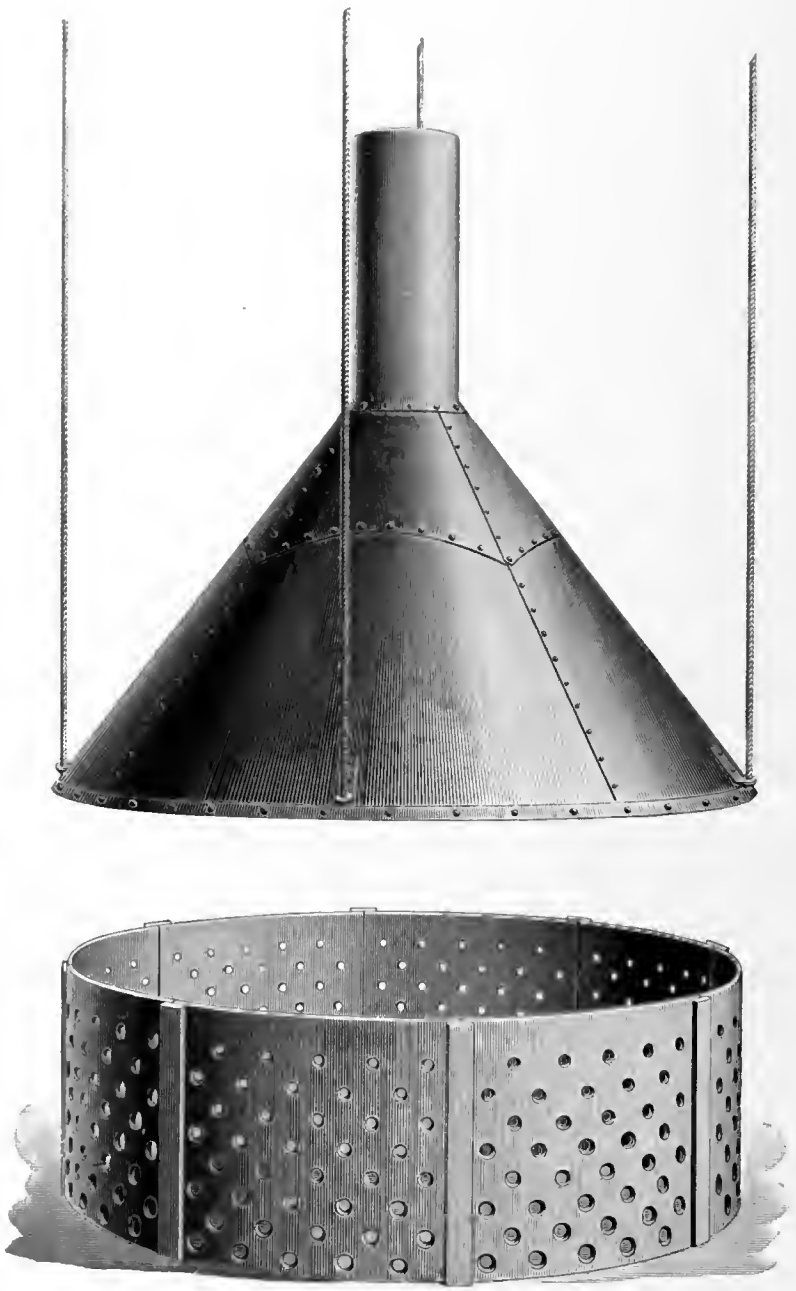
THE FRAME of this machine is exceedingly heavy and well proportioned. It is cast with cored center and broad floor base.

THE BENDING ROLLS are of chilled iron, exceedingly hard, to prevent wear. The upper one is provided with a horizontal adjustment by hand wheel and screw to accommodate various circles of work and different thicknesses of material. A lock nut attached to the screw firmly holds the upper roll in proper position. The rolls are all open at the working side so that the finished tires can be quickly removed.

IT IS the most convenient and best arranged machine for this work on the market. It is fitted with heavy steel spindles throughout, which run in long bronze bearings fitted into bored and reamed holes. All the gears are cut from the solid, and the power to drive them is communicated through a friction clutch operated by a convenient foot treadle at the working side of the machine. The operator has perfect control over the machine, starting or stopping instantly by a slight touch of the foot upon the treadle.

THE FRICTION CLUTCH is 16″ diameter, 6¼″ face, and it should run 540 rotations per minute. It can be belted direct from the main line.

HORSE POWER to drive, 2½; floor space occupied, 42″ × 64″.



No. 1 Improved Tire Heater.

Export Shipping Weight, 1,480 Pounds.

Net Weight, 1,280 Pounds.

Cubic Measurement, 225 Feet.

Cable Word. TEMPER.

No. 1 Improved Tire Heater.

Export Shipping Weight, 1,480 Pounds.

Net Weight, 1,280 Pounds.

Cubic Measurement, 225 Feet.

Cable Word, TEMPER.

THIS ENGRAVING represents our Improved Tire Heater with adjustable smoke hood which has been designed for the use of wagon and wheel makers for heating tires such as used on vehicle wheels. It is a decided improvement over the old method, as by its use a small amount of fuel is consumed and the objectionable feature of having the building filled with smoke is avoided, and it proves a safeguard against fire to the building.

IT WILL heat six sets of ordinary tires at one filling, and as fast as the heated tires are removed it can be refilled, having sufficient capacity to accommodate the requirements of large wagon and wheel makers.

THE HEATER or fire pot is a heavy cast iron ring built of eight sections which are strongly reinforced, and it is filled with holes through which the necessary draft for the fire is obtained. It is 6 feet diameter, 20″ deep, and weighs 800 pounds.

THE SMOKE HOOD is 6 feet diameter, weighs 480 pounds, and is supported by four weighted cables running over iron sheaves to counterbalance it, thus enabling the operator to adjust it up or down. The smoke pipe on the top is 12″ diameter and it slides in a stationary pipe attached to the ceiling.

FLOOR SPACE occupied, 72″ × 72″.

Patent Tire Setting and Cooling Machine.

No. 1 MACHINE.

Export Shipping Weight, 1,700 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 42 Feet.
Cable Word, TOWER.

No. 2 MACHINE.

Export Shipping Weight, 2,200 Pounds.
Net Weight, 1,500 Pounds.
Cubic Measurement, 47 Feet.
Cable Word, THAMES.

No. 3 MACHINE.

Export Shipping Weight, 2,600 Pounds.
Net Weight, 1,700 Pounds.
Cubic Measurement, 52 Feet.
Cable Word, THOMAS.

Patent Tire Setting and Cooling Machine.

No. 1 MACHINE.

Export Shipping Weight, 1,700 Pounds.
Net Weight, 1,200 Pounds.
Cubic Measurement, 42 Feet.
Cable Word, TOWER.

No. 2 MACHINE.

Export Shipping Weight, 2,200 Pounds.
Net Weight, 1,500 Pounds.
Cubic Measurement, 47 Feet.
Cable Word, THAMES.

No. 3 MACHINE.

Export Shipping Weight, 2,600 Pounds.
Net Weight, 1,700 Pounds.
Cubic Measurement, 52 Feet.
Cable Word, THOMAS.

THIS ENGRAVING represents a Patent Tire Setting and Cooling Machine used by wagon and wheel manufacturers for setting and shrinking the tires upon carriage, wagon, truck, and heavy artillery wheels.

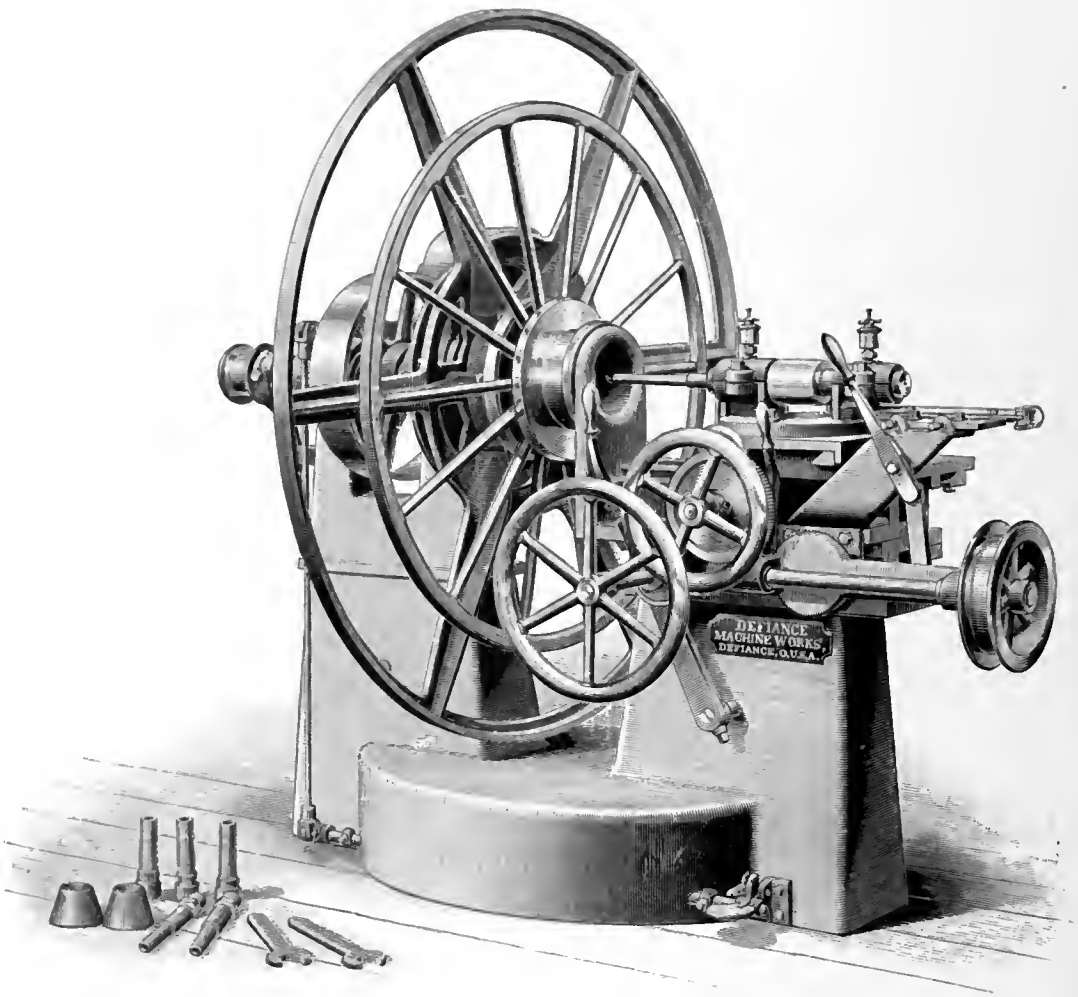
THIS MACHINE has been designed to reduce the labor in fitting the tires upon the wheels, to increase the capacity and improve the quality of work. Previous to its introduction this work was accomplished entirely by hand, being a slow process; the heated tires would, in most cases, badly burn or char the wheels before the operation could be completed.

THE IRON TABLE, upon which the wheels rest while being operated upon, is cast in one piece with a true surface, and provided with a large hole in its center to receive the end of the hub, and allow the wheel's rim to rest evenly upon the table, so that the tires can be accurately trued up and straightened sidewise; it is also filled with a large number of small holes through which the water passes when it is being raised. It is fitted with spring balances which enables the operator to raise and lower it with perfect ease. The mechanism employed for raising and lowering the table consists of heavy perpendicular racks with pinions located at each quarter in connection with a large hand-wheel. It can be locked to hold the table firm at any position; this entire arrangement is very durable, to withstand the heavy labor expected of it.

WHEN IN USE the tub is filled with water within about 7″ of the top, and the table is elevated to its highest position above the water to receive the wheel, which is then placed upon the table as shown, with the front end of hub projecting downward through the large hole in the center of the table; the heated tire is then trued up in position upon the wheel's felloe, when by a single turn of the hand-wheel the table and wheel are submerged below the surface of the water, causing the tire to shrink and cool uniformly and quickly.

THREE SIZES OF MACHINES are furnished: No. 1, the smallest, is fitted with a table 58″ diameter, ⅞″ thick, with hole in center 23″ diameter; weight of table, 650 pounds; the tub measures 6 feet diameter by 24″ deep inside, and it weighs 550 pounds. This machine is used by standard spring and farm wagon builders. The No. 2 machine is provided with a table 63″ diameter, 1″ thick, with 23″ hole in center, and it weighs 800 pounds; the tub measures 6 feet 6″ inside diameter, 24″ deep, and it weighs 600 pounds. No. 3 machine is fitted with a table 72″ diameter, 1¼″ thick, with 30″ hole in center, and it weighs 1,200 pounds; the tub is 87″ diameter, 24″ deep inside, and weighs 1,000 pounds. This machine is used for wheels up to 72″ diameter.

FLOOR SPACE occupied, 97″ × 97″.



No. 0 Patent Automatic Wheel Boxing Machine.

Export Shipping Weight, 3,800 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 136 Feet.

Cable Word, BRAZING.

No. 0 Patent Automatic Wheel Boxing Machine.

Export Shipping Weight, 3,800 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 136 Feet.

Cable Word, BRAZING.

THE ACCOMPANYING ENGRAVING represents a machine which embodies the first successful attempt at holding, for the operation of boring, a light vehicle wheel securely and truly.

THE FACILITY AND CERTAINTY with which the wheel can be grasped are obvious from the illustration. A cylindrical plunger with a conical interior, and actuated by a spring, receives the point of the hub, thereby centering it truly; the rim of the wheel is secured in a true plane by resting against the arms of the face plate of the machine; and two revolving padded disks embrace the spokes near the hub to hold the wheel firmly in the desired position. The wheel is thus secured in a space of time not exceeding five seconds. 600 wheels can be bored in ten hours.

THE CONTOUR of the axle box to which the wheel is bored is faithfully followed by an automatic device which relieves the operator of all care and attention.

PROVISION IS MADE for cupping both ends of the hub to any desired shape or size.

THE FEED is automatic, and it is arrested, at the end of the cut, by an automatic stop, thus leaving the operator a few seconds of time in which to dispose of his finished and unfinished wheels.

THE OUTER REVOLVING binding pad, by which the wheel is held, is furnished with forty steel balls, $\frac{5}{8}''$ diameter, to eliminate undue friction.

THE INNER PAD is instantly adjustable to suit the varying dish of wheels. Thus the springing or distortion of the wheels is avoided.

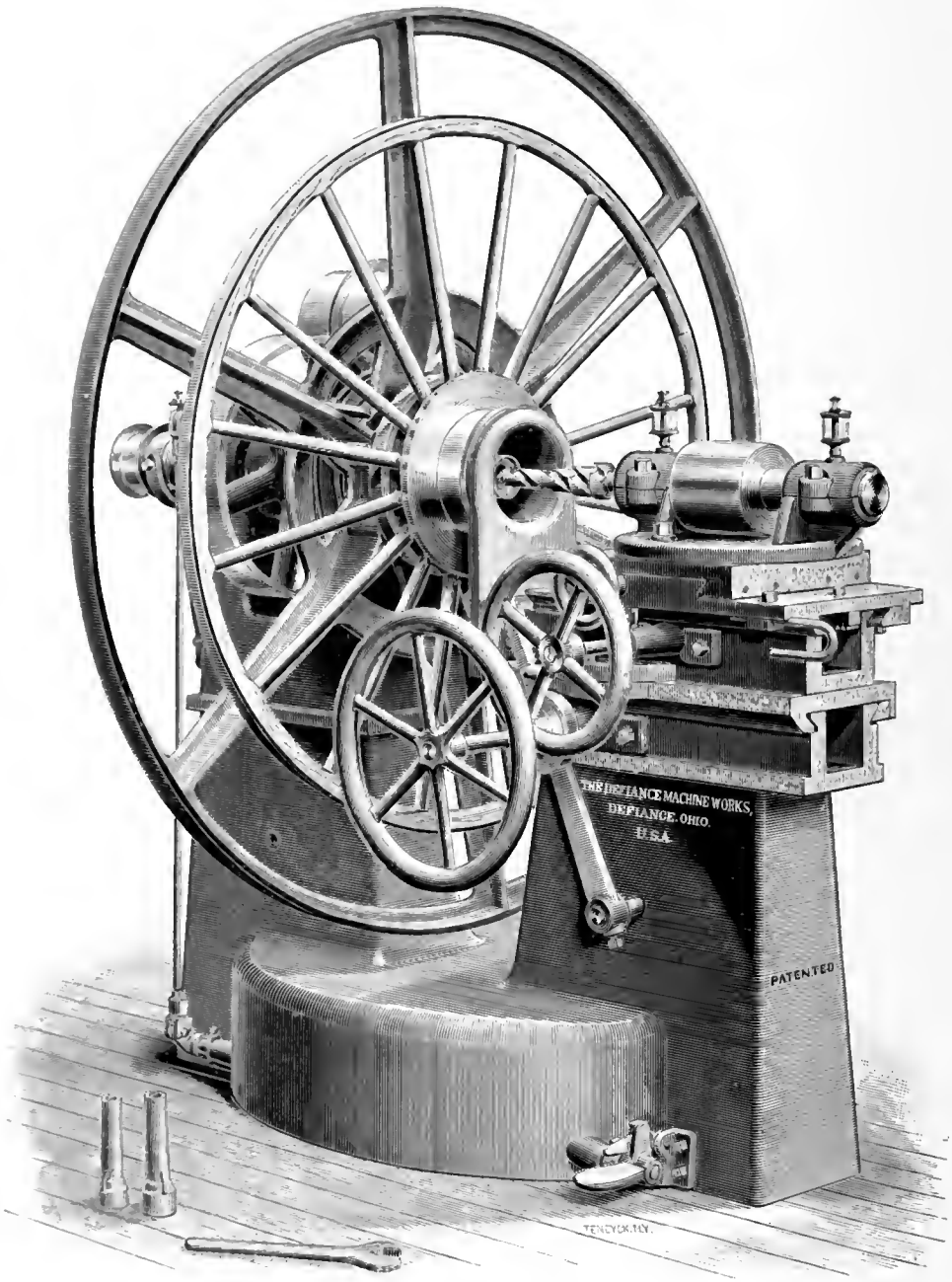
THE WHEEL is rotated at 200 turns a minute, and the cutter 5,000 turns.

THE MACHINE is made with unusually heavy parts, the wearing surfaces of which are as large and as well fitted as those of machinists' tools.

THIS IS an entirely new departure in the treatment of wheels for the purpose above stated, and it avoids the unskillful and time-taking fumbling heretofore practiced in securing wheels in a box-setting machine. Better work also is insured, by reason of the greater exactness and security with which the wheels are held.

THE COUNTER should be placed above the main axis of the machine, and should make 700 rotations per minute. Tight and loose pulleys, $12'' \times 6''$ face; shaft, $1\frac{15}{16}'' \times 9$ feet $6''$; three No. 3 ball and socket drop hangers; two $1\frac{15}{16}''$ slip collars; one pulley $6'' \times 5''$ for driving face plate; one pulley $20'' \times 7''$ for driving front cupping spindle; one pulley $24'' \times 23''$ for driving main boring spindle; one shipper complete.

HORSE POWER to drive, 3; floor space occupied, $60'' \times 76''$.



No. 00 Patent Automatic Wheel Boxing Machine.

Export Shipping Weight, 3,800 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 136 Feet.

Cable Word, BOZADO.

No. 00 Patent Automatic Wheel Boxing Machine.

Export Shipping Weight, 3,800 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 136 Feet.

Cable Word, BOZADO.

THIS ENGRAVING represents our No. 00 Patent Automatic Wheel Boxing Machine, especially designed for rapidly and accurately boring, facing, and cupping the hub of carriage and spring wagon wheels, fitting the same complete for the reception of the box, at the rate of about 1,000 wheels per day.

IT IS the only automatic machine for treating wheels that is capable of doing the work and producing wheels that will run true at the hub and rim and track properly when placed upon the vehicle.

THE FRAME of this machine is heavy and substantial. It is cast in one piece with cored center and provided with a broad floor base to stand firm.

THE WHEEL-HOLDING DEVICE consists of a large revolving chuck fitted at its center with a cylindrical plunger with a conical interior and actuated by a spring to receive the front end of the hub, thereby centering it truly. The rim of the wheel is secured in a true plane by resting against the arms of the chuck or face-plate of the machine, and two revolving padded discs embrace the spokes near the hub to hold the wheel firmly in the desired position. By this method the wheel can be instantly placed in or removed from the machine by the movement of a single hand-wheel without the use of a wrench.

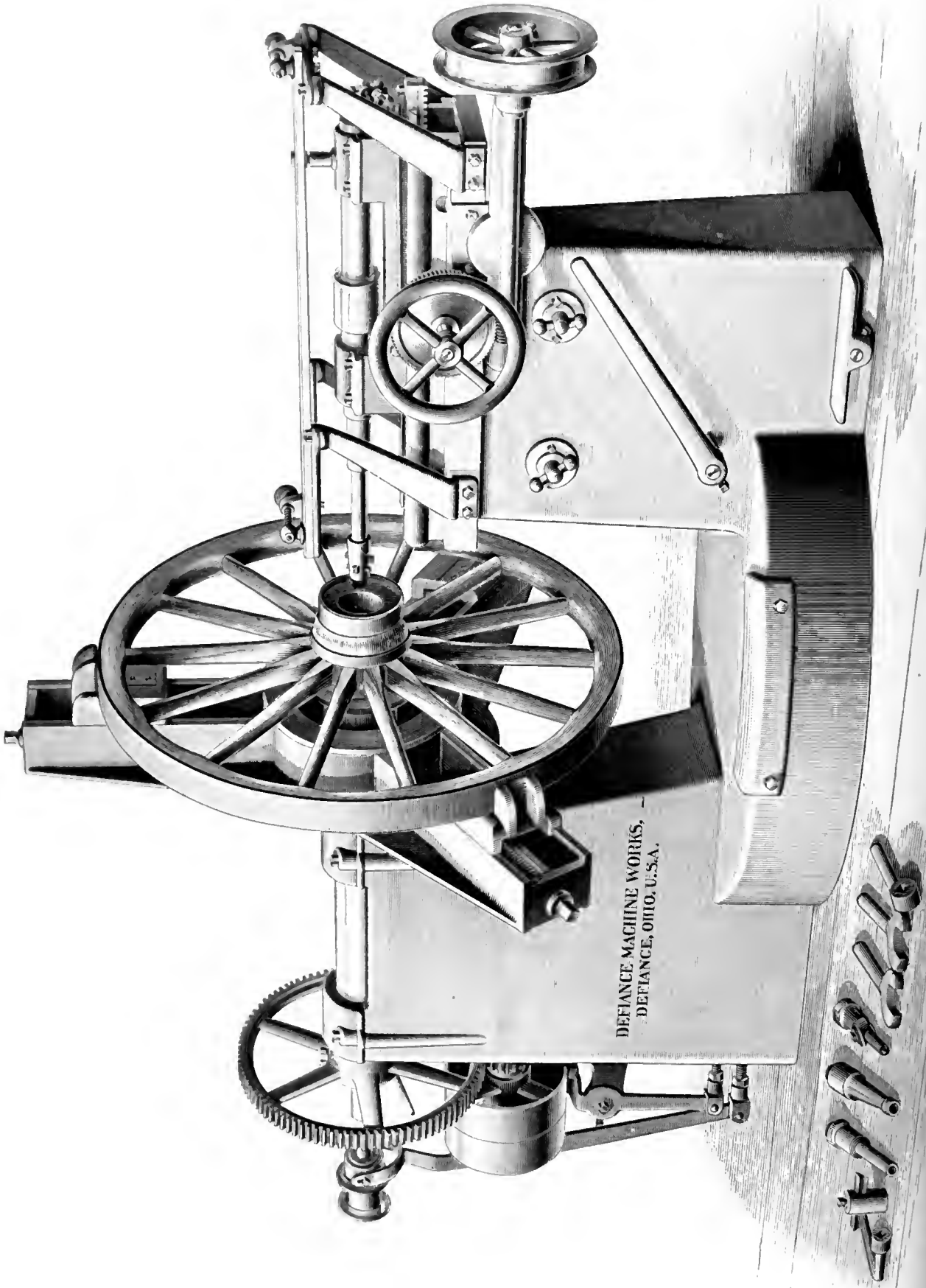
THE BORING SPINDLE, of hammered steel, rotates in heavy bearings, and it is provided with lateral adjustment to regulate the size of hole to be bored. The boring tool is made to suit the shape of the box to be fitted, requiring a tool for each different shape of box. It is screwed into the end of the spindle and it can be quickly placed in or out.

THE FEED is automatic, and it is arrested at the end of the cut by an automatic stop, thus leaving the operator a few seconds of time in which to dispose of his finished and unfinished wheels.

THE OPERATOR has complete control over the machine from the working side. The chuck and all the rotating parts of the headstock can be set in motion or instantly arrested by a single movement of the foot of the operator upon the pedal at the base of the machine. The boring and the cupping of the hub is all accomplished at one starting and stopping of the machine.

THE COUNTER should be placed immediately above the main axis of the machine. The tight and loose pulleys are $12'' \times 6''$; driver for boring spindle, $18'' \times 23''$, with straight face; pulley on boring spindle, $5\frac{1}{2}'' \times 5\frac{1}{2}''$; speed of boring spindle, 2,290; driver for cupping spindle, $20'' \times 7''$, with straight face; driver for large wheel chuck, $6'' \times 5''$; drive the feed pulley on the machine from the shaft; three No. 3 ball and socket adjustable drop hangers; countershaft, $1\frac{1}{16}'' \times 9$ feet $6''$; speed, 700 turns per minute.

HORSE POWER to drive, $3\frac{1}{2}$; floor space occupied, $60'' \times 76''$.


DEFIANCE MACHINE WORKS,
DEFIANCE, OHIO, U.S.A.

No. 1 Automatic Wheel Boxing Machine.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 4,700 Pounds.

Cubic Measurement, 198 Feet.

Cable Word, BONNELL.

THE NO. 1 AUTOMATIC WHEEL BOXING MACHINE, as shown by the accompanying engraving, is used by the principal wagon and carriage builders for boring the wheel's hub for the reception of the box.

IT IS CALCULATED to bore and finish the hole at one cut to any shape, regular or irregular in form, to suit the shape of the box to be used therein, relieving the center of the hub around the spokes, and cupping both ends of the hub to any desired shape.

ALL THIS is performed at one starting and stopping, and 600 wheels can be fitted complete in ten hours. It is calculated to perform either light carriage and spring wagon work or heavy work for farm wagon, truck, and artillery wheels.

IT POSSESSES every convenience of operation, is thoroughly durable, and unusually well adapted to rapid and accurate work.

THE CORED FRAME is cast in one piece, and is heavy and substantial throughout, care having been taken in every way to secure a machine that will not spring, jar, or chatter when performing the heaviest class of work.

THE CHUCK IS UNIVERSAL and fitted to a 6″ spindle. All the dogs are actuated simultaneously, by turning with a wrench any one of the three screw heads, opening and closing them to receive wheels from 20″ to 60″ diameter.

THE BORING BAR, of hammered steel, 2½″ diameter, makes 4,000 rotations per minute, and has lateral and longitudinal adjustments to enable it to bore holes of any taper, size, or contour desired. For depthing at the back of hubs to accommodate the shoulder of axle a convenient cupping attachment is provided. The several operations of the boring bar or spindle are automatic. After completing the cut the feed is disengaged automatically, thus leaving the operator a few seconds' time in which to dispose of his finished and unfinished wheels.

THE CONTOUR of the axle box to which the wheel is bored is faithfully followed by an automatic device, which relieves the operator of all care and attention.

THE BORING CUTTER is of the most improved kind, consisting of three independent cutters of square tool steel, which are easily replaced at small expense, when worn out, or an S-shaped cutter, which is fitted into the end of boring bar.

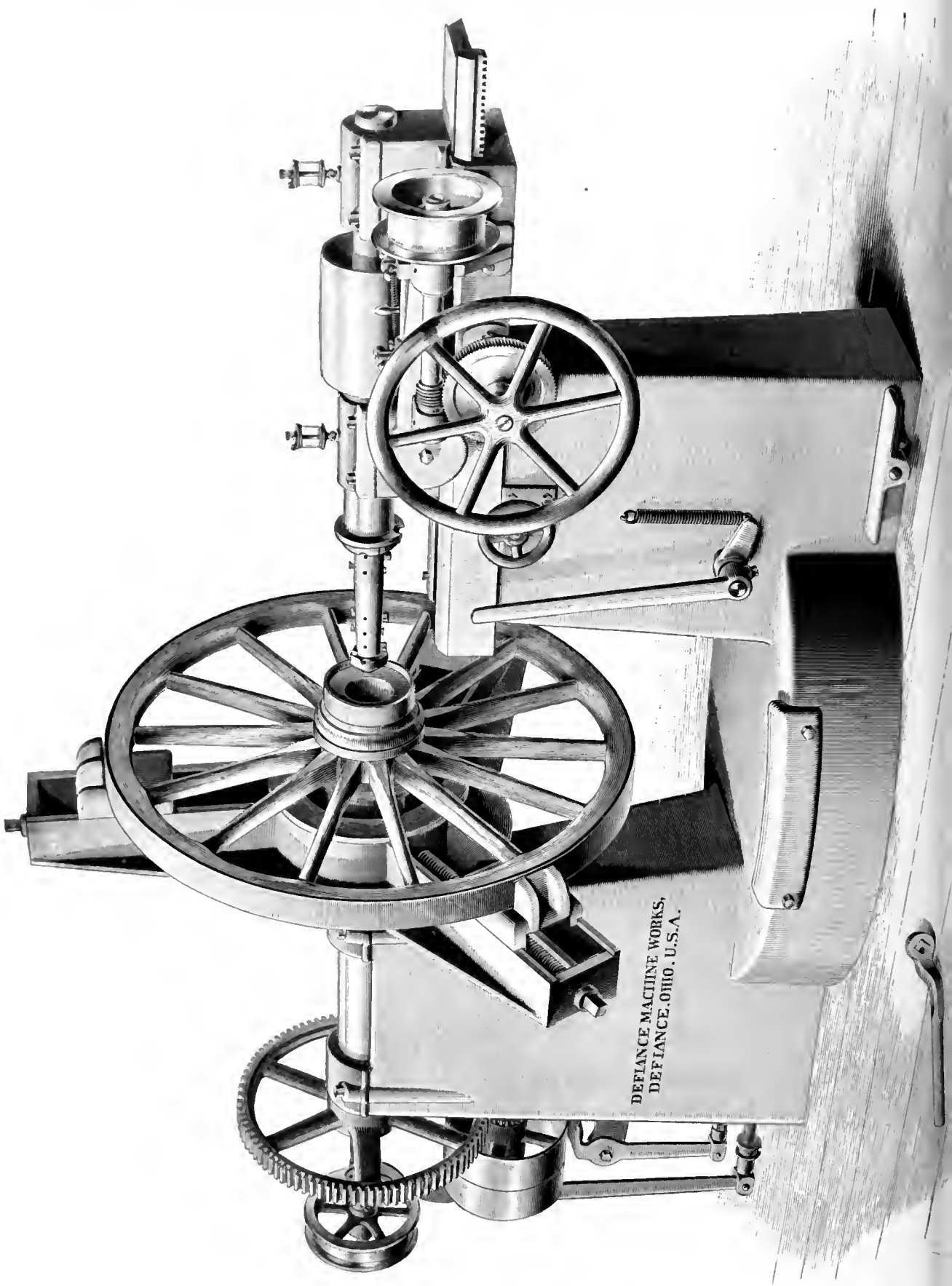
THE WHEEL is rotated at fifty turns per minute, and the cutters at 4,000 turns.

THE OPERATOR has complete control over the machine from the working side; the chuck and all other rotating parts of the headstock can be set in motion or arrested by a combination of shipper and brake by a single movement of the foot of the operator.

THE MACHINE is made with unusually broad wearing surfaces, and is as well fitted as those of machinists' tools.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}'' \times 11$ feet; three No. 3 ball and socket hangers; tight and loose pulleys, $12'' \times 6''$; pulley to drive chuck, $6'' \times 8''$ overhung; pulley to drive spindle, $30'' \times 22''$; pulley to drive feed, $4'' \times 4''$; shaft overhung, 4″; pulley to drive front cupping spindle, $20'' \times 7''$; speed of shaft, 550 rotations per minute; speed of boring spindle, 4,000; counter should be placed immediately above the main axis of the machine.

HORSE POWER to drive, 4; floor space occupied, $55'' \times 120''$.


DEFIANCE MACHINE WORKS,
DEFIANCE, OHIO, U.S.A.

No. 2 Automatic Wheel Boxing Machine.

Export Shipping Weight, 6,750 Pounds.

Net Weight, 5,250 Pounds.

Cubic Measurement, 202 Feet.

Cable Word, BROOK.

THIS ENGRAVING represents an improved No. 2 Automatic Wheel Boxing Machine, used by wagon and carriage builders, for boring the wheel's hub for the reception of the box; it is similar in construction to the No. 1 machine, excepting the boring device; it is calculated to bore and finish the hole at one cut and cup both ends of the hub, on either light carriage, spring wagon, farm wagon, or heavy truck wheels, with a capacity of 600 wheels per day.

THE WORKING PARTS are mounted upon a massive iron frame cast in one piece, with cored center of sufficient strength to handle the heaviest work without jar or chatter.

THE WHEEL CHUCK is universal, and is fitted to a 6″ spindle, all the dogs are actuated simultaneously by turning with a wrench any one of the three screw heads, opening and closing to receive wheels from 20″ to 60″ diameter; no care on the part of the operator is necessary in placing the wheel into the machine, as the chuck centers it true.

THE BORING SPINDLE, of hammered steel, is $2\frac{15}{16}$″ diameter, and makes 1,375 rotations per minute, with lateral adjustment for regulating the size of hole to be bored; the cutter head is provided with adjustable knives to perform the depthing at back of hub to accommodate the shoulder of axle; the several operations of the boring bar or spindle are automatic; after completing the boring and cupping of the back end of hub, the feed is automatically disengaged when the front cupper is brought forward and the cup for the nut completed. All the operations upon the wheel are accomplished at one starting and stopping of the machine.

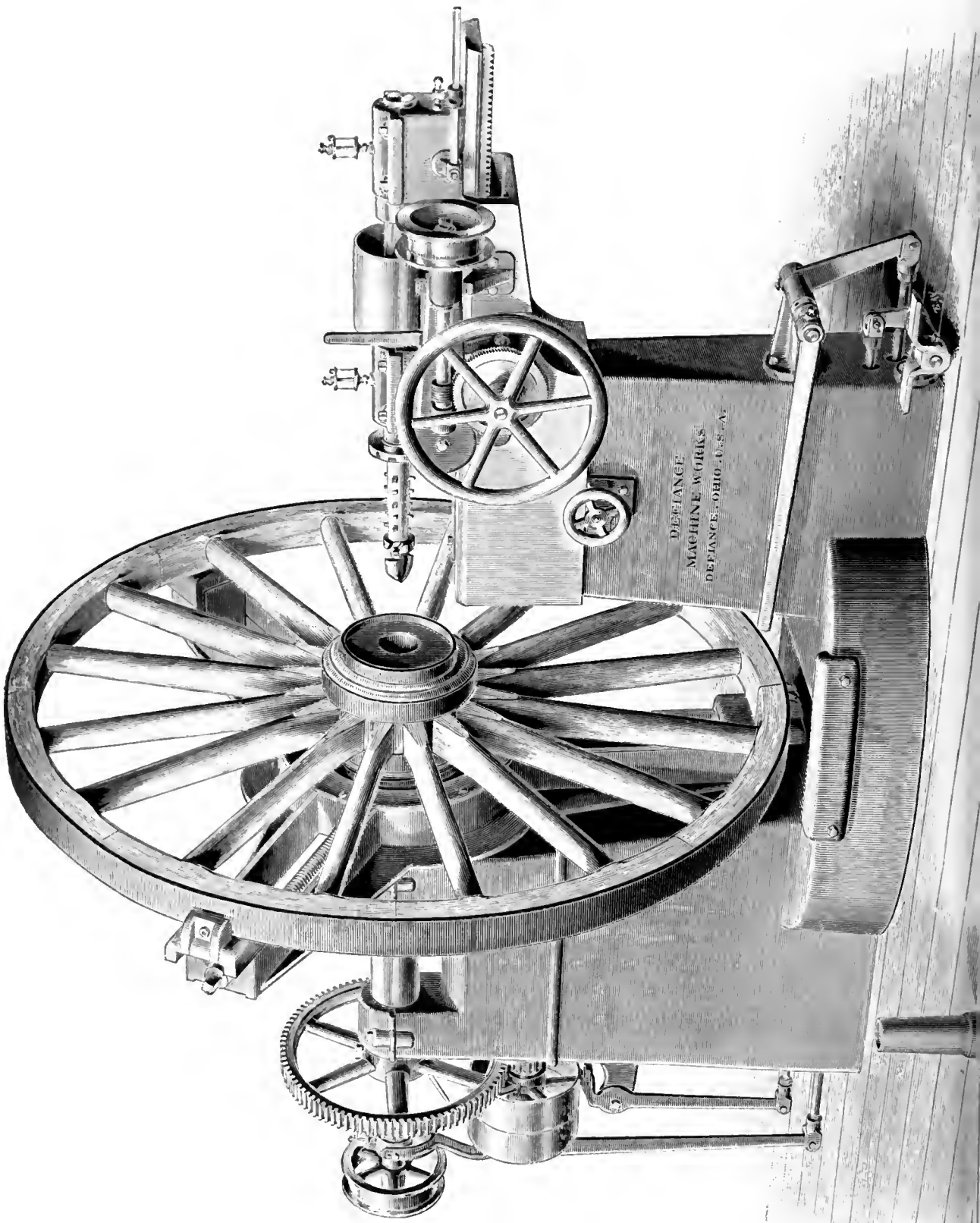
THE WHEEL is made to revolve at 50 turns per minute and the cutters 1,375 rotations, which produces a true running wheel and makes them track alike, a result that cannot be secured by any other process.

THE OPERATOR has complete control over the machine from the working side; the chuck and all other rotating parts of the headstock can be set in motion or arrested by a combination of shipper and brake, by a single movement of the foot of the operator.

ALL THE WEARING SURFACES are extra large and scraped to a perfect bearing similar to machine tool work.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ diameter, 12 feet long; three No. 3 ball and socket "J" drop hangers; tight and loose pulleys, 12″ × 8″; pulley to drive cutter head spindle, 20″ × 38″ face; pulley to drive front cupping attachment, 20″ × 7″; pulley to drive tight and loose pulleys on machine, 6″ × 8″; pulley to drive feed, 4″ × 4″; pulley on cutter spindle, 8″ × 8″; speed of counter, 550 rotations per minute. Counter should be placed immediately above main axis of the machine.

HORSE POWER to drive, 5; floor space occupied, 55″ × 121″.


DEFIANCE
MACHINE WORKS
DEFIANCE, OHIO, U.S.A.

No. 3 Automatic Wheel Boxing Machine.

Export Shipping Weight, 7,000 Pounds.

Net Weight, 5,000 Pounds.

Cubic Measurement, 285 Feet.

Cable Word, BRAZIL.

THIS ENGRAVING represents our No. 3 Special Heavy Automatic Wheel Boxing Machine, especially intended for the use of wagon, truck, and artillery wheel builders for boring the wheel's hub for the reception of the box. It is calculated to bore and finish the hole at one cut and cup both ends of the hub at one starting and stopping of the machine.

THE FRAME is a heavy casting in one piece of sufficient weight and strength to do the heaviest work without jar or chatter.

THE WHEEL CHUCK is universal and it is fitted to a 6″ spindle. All the dogs are actuated simultaneously by the turning with a wrench any one of the three screw heads, opening and closing to receive wheels from the small sizes up to 75″ in diameter at the largest. The chuck holding the wheel being universal accurately centers the wheel without any care on the part of the operator.

THE BORING SPINDLE, of steel, large in diameter, runs in long, self-oiling bearings. The cutter bar is screwed into the end of the spindle and it is equipped with adjustable knives to finish the boring at one insertion into the hub, including the cupping or depthing at back of hub to accommodate the shoulder of the axle. The several operations of the boring spindle are automatic. After the hub has been bored to the required size and the back end cupped, the feed is automatically disengaged, at which time it is moved back as shown by the engraving. Then the front cupping attachment is brought into action and the cup at the front end of the hub for the axle nut is completed. The adjustments and movements of this machine are so quickly secured that six hundred wheels can be finished in ten hours with it.

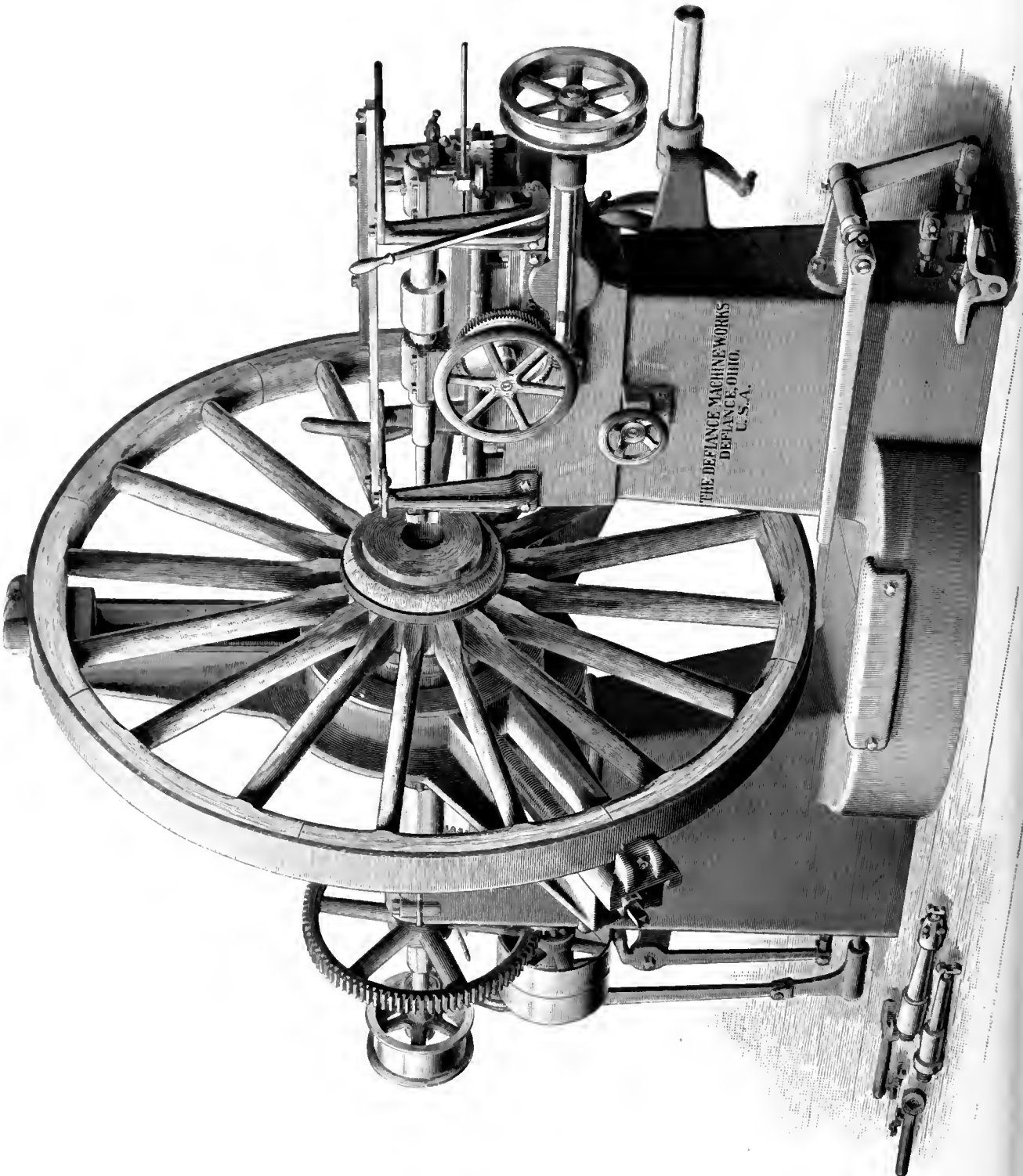
THE WHEEL is made to revolve at fifty turns per minute and the boring bar at 1,375 rotations. A set of wheels treated by this method will run true and track alike when placed upon the axle, a result that can be secured by no other machine.

THE OPERATOR has complete control over the machine from the working side. The chuck and all the rotating parts on the headstock can be set in motion or arrested by a combination of shipper and brake, by a single movement of the foot of the operator.

THIS MACHINE is the largest and most powerful of its kind built and it is fitted with the greatest care. All the wearing surfaces are extra large and are scraped to a perfect bearing.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″ diameter, 12 feet long; three No. 3 ball and socket adjustable "J" drop hangers; tight and loose pulleys, 12″ × 8″; pulley to drive cutter head spindle, 20″ diameter, 38″ face; pulley to drive front cupping attachment, 20″ diameter, 7″ face; pulley to drive tight and loose pulleys on machine, 6″ diameter, 8″ face; pulley to drive feed, 4″ diameter, 4″ face; pulley on cutter spindle, 8″ × 8″; speed, 550 rotations per minute. Counter should be placed immediately above main axis of the machine.

HORSE POWER to drive, 5; floor space occupied, 76″ × 121″.


THE DEFIANCE MACHINE WORKS
DEFIANCE, OHIO.
U. S. A.

No. 4 Automatic Wheel Boxing Machine.

Export Shipping Weight, 7,000 Pounds.
Net Weight, 5,300 Pounds.
Cubic Measurement, 285 Feet.
Cable Word, BOXWELL.

THIS ENGRAVING represents our No. 4 Automatic Wheel Boxing Machine, especially designed for the use of wagon, truck, and artillery wheel builders, for boring automatically the wheel's hub for the reception of the box. It bores and finishes the hole in the hub at one cut, and faces off both ends of the hub at one starting and stopping of the machine, and it performs the work so that when the box is placed into the hub, it will always come the same distance from the edge of the tire, regardless of any variation there may be in the dish of the wheel. Therefore wheels treated by this machine will run true and track alike.

THE FRAME is a massive casting in one piece with cored center and a closed bottom for strength, and it is of sufficient weight to do the heaviest work with ease.

THE WHEEL CHUCK is universal and fitted to a 6″ diameter spindle, running in heavy bearings. All the dogs on the chuck are actuated simultaneously by turning with a wrench any one of the three screw heads and they open and close to receive wheels from 20″ up to 75″ diameter at the largest. The wheel chuck, being universal, accurately centers the wheel without any care on the part of the operator.

THE BORING SPINDLE, of hammered steel, is of large diameter and it rotates in heavy self-lubricating bearings at 4,000 turns per minute. Has lateral and longitudinal adjustments to enable it to bore holes of any taper, size, or contour desired. The several operations of the boring bar are automatic. After completing the cut, the feed is disengaged automatically, thus leaving the operator sufficient time to dispose of his finished and unfinished wheels.

THE CONTOUR of the axle box to which the wheel is bored is faithfully followed by an automatic device which can be instantly adjusted for any size box, and it relieves the operator of all care and attention.

THE CUTTER HEAD used in the end of the boring spindle is of improved construction and it cuts perfectly smooth and true, a single cutter head covering all the sizes of boring for medium and heavy wheels.

THE CUPPING of the front end of the hub is accomplished by a spindle running through the large chuck spindle, carrying a suitable cutter, and it is brought forward to its work by a convenient hand lever, and the rear cup is cut in the back end of the hub by a stationary cutter which is brought in use by a single movement of a lever controlling an improved cupping device. The operator has complete control over the machine from the working side. The chuck and all the rotating parts in the head-stock can be set in motion or arrested by a single movement of a foot treadle.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}$″×11 feet; three No. 3 ball and socket adjustable drop hangers with new style shipper attached; pulley to drive chuck, 6″×8″, overhung on shaft; pulley to drive boring spindle, 30″×22″; pulley to drive feed, 4″×4″; pulley to drive front cupping spindle, 20″×7″; tight and loose pulleys, 12″×6″; speed, 550 turns per minute. The counter should be placed immediately above the main axis of the machine.

HORSE POWER to drive, 4½; floor space occupied, 76″×121″.

No. 0 Patent 60-Ton Hydraulic Hub Band and Flange Press.

Export Shipping Weight, 3,600 Pounds.

Net Weight, 3,000 Pounds.

Cubic Measurement, 112 Feet.

Cable Word, PISTON.

No. 0 Patent 60-Ton Hydraulic Hub Band and Flange Press.

Export Shipping Weight, 3,600 Pounds.
Net Weight, 3,000 Pounds.
Cubic Measurement, 112 Feet.
Cable Word, PISTON.

THIS ENGRAVING represents our Improved 60-Ton Hydraulic Band and Flange Press, which has been designed for the use of wagon and wheel manufacturers for pressing bands on wagon hubs, compressed bands on hubs for carriage wheels, and for setting Sarven flanges before the spokes are driven.

THE FRAME is massive and heavy, with the base in one piece with cored center, of sufficient strength to withstand a pressure of 100 tons.

ITS CAPACITY is sufficient to receive a hub up to 18″ long between the top of ram and head of screw, and it is 24″ wide between the uprights.

THE ADJUSTING SCREW, above the ram, is of 4″ steel, and it is provided with suitable handles to bring the screw down quickly against the work, enabling the operator to instantly adjust the machine for a short or long hub, and entirely avoid the use of blocking for filling in, and to secure a positive pressure against the work when the power is applied.

A DOUBLE PUMP, constructed of phosphor bronze and of the most modern kind, is used. Unlike others, it will not get out of order. It is located within the liquid reservoir attached to the base of the main frame, close up to the cylinder, so that instant action to the ram is secured in starting the pumps. All the working parts of the pumps are submerged in oil, securing perfect lubrication, and it is thoroughly covered to exclude dust or dirt.

THE RAM is 8″ diameter, and the liquid is delivered to it through hydraulic tubing; the relief pipe is of extra large size, to accommodate a quick return movement; the movement of the ram can be gauged with accuracy to any stroke required, and automatically arrested at any point to which it may be set, and, when once adjusted, bands and flanges may be accurately pressed on without any attention on the part of the operator, excepting to place the work into the machine.

A NOVEL SELF-CENTERING DEVICE is furnished, as shown, for correctly centering Sarven hubs with reference to the mortises, and the rivet holes in the flanges; by its use the rivet holes will agree with each other and clear the mortises.

THE SAFETY VALVE can be adjusted to blow off at any desired pressure; it acts as a safeguard, and it will instantly relieve the pressure from the ram should an excessive strain above what is required be applied.

THE PRESSURE GAUGE is inclosed within a highly finished brass case, and it indicates the exact amount of pressure being applied.

THE LIQUID used should be free from grit or other foreign substance; a light engine oil is recommended.

THE FRICTION CLUTCH, located on top of the frame out of the way, is used for driving the pumps, which is connected by hand lever, and it is automatically tripped to cut off the power when the desired stroke of the ram is reached, or it may be operated by hand and stopped instantly at any point, the operator having complete control over the machine, regulating the stroke and the pressure from 0 to 60 tons by the movement of a single lever.

THE FRICTION, when disengaged, acts as a loose pulley; it is 24″ diameter, 4″ face, and should run 450 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, 38″×42″×109″ high.

No. 1 Improved Iron Frame Power Pressing Machine.

Export Shipping Weight, 4,800 Pounds.

Net Weight, 4,100 Pounds.

Cubic Measurement, 96 Feet.

Cable Word, PENMAN.

No. 1 Improved Iron Frame Power Pressing Machine.

Export Shipping Weight, 4,800 Pounds.
Net Weight, 4,100 Pounds.
Cubic Measurement, 96 Feet.
Cable Word, PENMAN.

THE ACCOMPANYING ENGRAVING represents an Improved Iron Frame Power Pressing Machine, especially designed to meet the requirements of wagon, carriage, and wheel manufacturers, for pressing the axle box into the wheel's hub, and pressing bands and flanges thereon.

IT IS CALCULATED to cover any requirement for both light carriage or heavy wagon and truck work. The pressure under the screw can be instantly regulated from one pound to 60,000 pounds, to suit the different classes of work.

THE WORKING PARTS are mounted upon a massive iron frame of handsome design, cored out, well braced, and very stiff.

THE SCREW, OF STEEL, 3″ diameter, ½″ pitch, is supported in heavy bearings and driven by powerful gearing. The up and down movement is sufficient to accommodate 24″ at most between end of screw and top of bed plate.

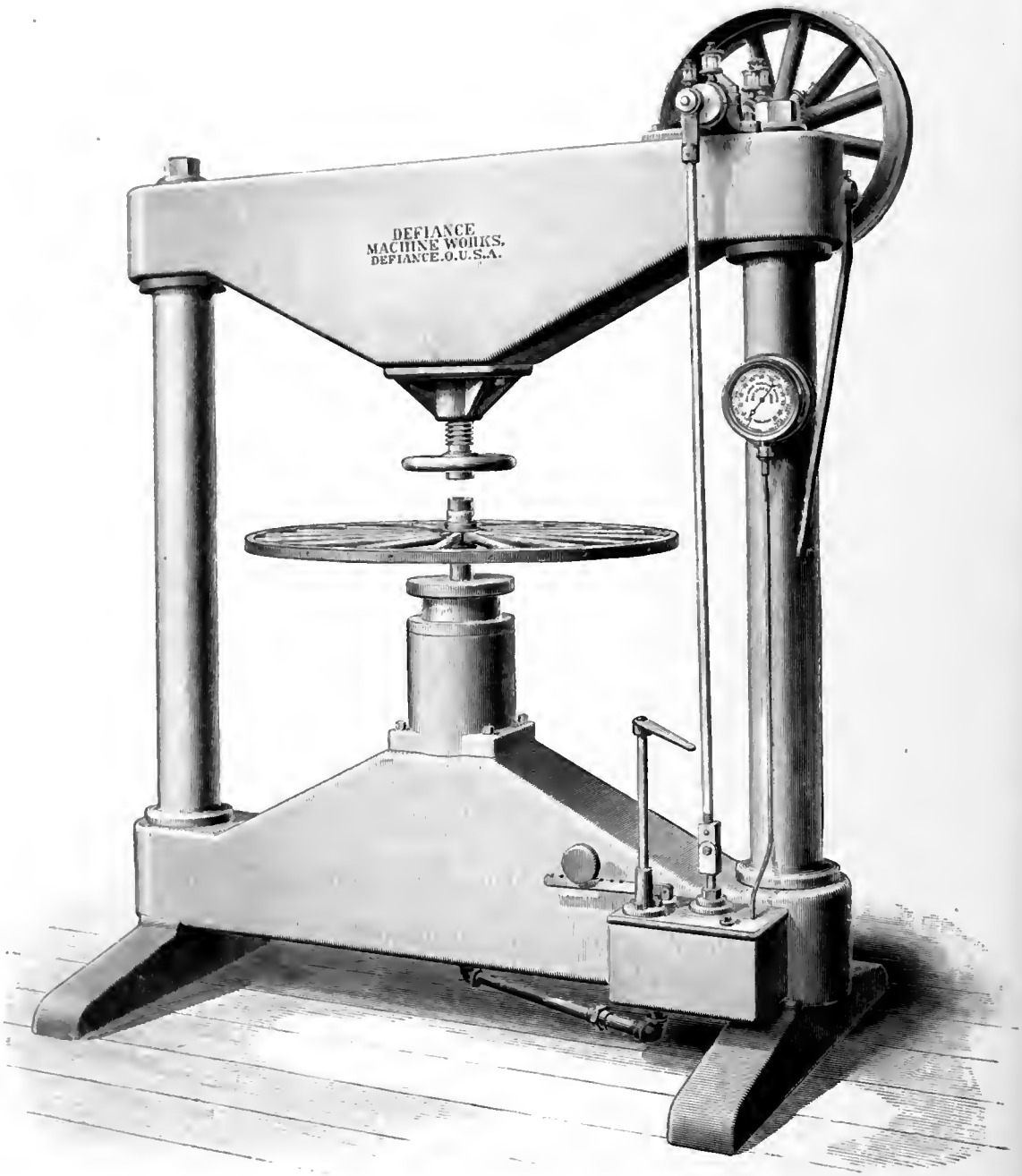
THE WEIGHT of this machine is 4,100 pounds, and it will receive a wheel 60″ diameter at the largest, with capacity sufficient to exert a pressure of 60,000 pounds.

THE COUNTER is a portion of the machine. It is mounted on top of the main frame out of the way; the shaft is $2\frac{7}{8}$″ diameter, and it is driven by a powerful double friction clutch 24″ × 3″, connected by hand lever located convenient to the operator; a slight movement of the lever from right to left instantly starts the screw up or down, and when the operator's hand is removed from the lever the frictions are automatically disengaged and the screw stopped.

THE OPERATION of this machine is very quick and simple; a single operator can handle this and one of the Defiance Power Feed Automatic Wheel Boxing Machines and complete the setting of boxes in 150 sets of wheels in ten hours.

SPEEDS of friction pulleys are as follows: Friction for running down motion of screw 24″ × 4″, 150 rotations, and 300 rotations per minute for 24″ × 3″ friction for upward movement of screw; two pulleys are required for main line shaft, each with 4″ face.

HORSE POWER to drive, 1; floor space occupied, 48″ × 84″ × 109″ high.



No. 2 Patent 60-Ton, Iron Frame, Hydraulic Wheel Press.

Export Shipping Weight, 5,200 Pounds.
Net Weight, 4,000 Pounds.
Cubic Measurement, 109 Feet.
Cable Word, PRINTING.

No. 2 Patent 60-Ton, Iron Frame, Hydraulic Wheel Press.

Export Shipping Weight, 5,200 Pounds.
Net Weight, 4,000 Pounds.
Cubic Measurement, 109 Feet.
Cable Word, PRINTING.

THE ACCOMPANYING ENGRAVING represents an Improved Iron Frame, 60-Ton, Hydraulic Wheel Press, used by wagon, carriage, and wheel builders, for pressing boxes into the wheel's hub and pressing bands and flanges thereon.

TO MEET THE DIFFICULTY of tendency to warp and spring in wood frame presses and to accommodate the heavier strains now required of this class of machinery, we have devised this new all iron frame press, which enables a steady pressure to be maintained.

IT WILL receive wheels up to 60″ diameter, and will take 18″ between the head of screw and top of ram.

THE ADJUSTING SCREW, as shown immediately above the ram head, is 4″ diameter and provided with a hand-wheel by which the head of screw can be quickly brought to bear against the work, enabling the operator to instantly adjust the machine for short or long hubs, entirely avoiding the use of blocking for filling in, which is necessary with other machines of this kind. This improvement effects a large saving in time.

THE DOUBLE PUMP, of phosphor bronze, is extremely simple in construction, and it is almost impossible to get it out of order. It is located within the liquid reservoir attached to the base of the main frame close to the cylinder, thereby securing a quick action to the ram in starting the pump. A detachable lid covers the liquid and pumps, protecting them against dirt or injury.

THE RAM is 8″ diameter, and the liquid is delivered to it through hydraulic tubing. The relief pipe is of large size to accommodate a quick return movement to the ram in backing off.

THE SAFETY VALVE can be set to blow off at any desired pressure, acting as a safeguard. It will instantly relieve the pressure from the ram and discharge the liquid back into the reservoir should the pressure at any time exceed the safety limit.

THE PRESSURE GAUGE is inclosed within a highly finished brass case, and it shows the amount of pressure both in tons and per square inch applied to the ram.

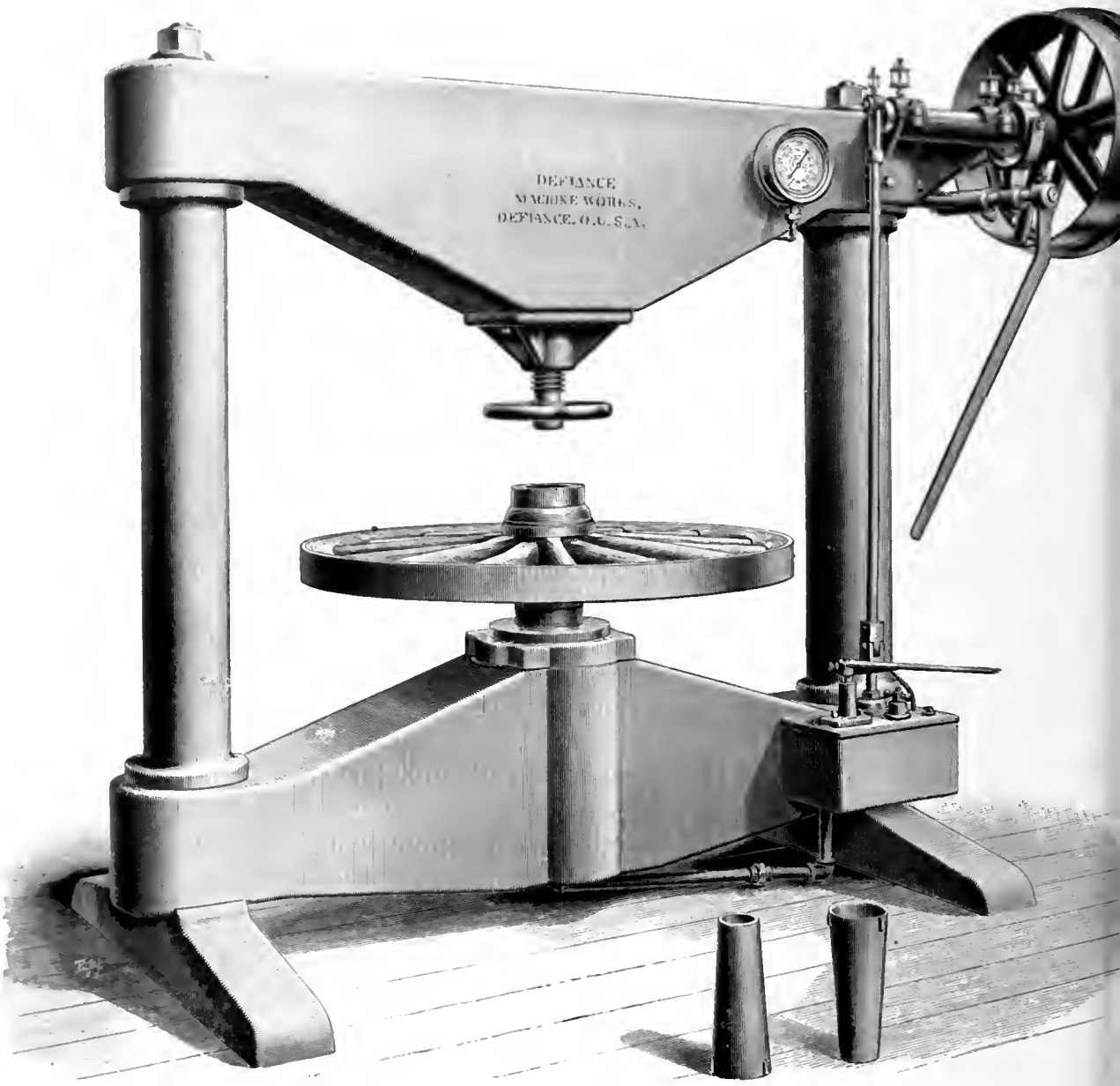
THE LIQUID used should be free from grit or other foreign substance. Light engine oil is preferred, although crude petroleum or other oils of this nature will answer.

A POWERFUL FRICTION CLUTCH, fitted to a $2\frac{7}{16}$″ steel spindle, mounted on top of the main frame out of the way and driven by a 4″ belt, communicates power for operating the pumps. The frictions are engaged or disengaged instantly by a slight movement of a hand lever, placed convenient to the operator, to start or stop the machine. When disengaged, the friction acts as a loose pulley.

EACH MACHINE is tested to a pressure of 80 tons, which is far in excess of the power required of the machine.

THE FRICTION PULLEY is 24″ diameter, 4″ face; speed, 450 rotations per minute. Can be belted to from above, below, or either side, direct from the main line. Pulley for main line shaft should have 4″ face.

HORSE POWER to drive, 1; floor space occupied, 48″×96″×109″ high.



No. 3 Patent 80-Ton, Low Down, Iron Frame, Hydraulic Wheel Press.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 5,000 Pounds.

Cubic Measurement, 256 Feet.

Cable Word, PACIFIC.

No. 3 Patent 80-Ton, Low Down, Iron Frame, Hydraulic Wheel Press.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 5,000 Pounds.

Cubic Measurement, 256 Feet.

Cable Word, PACIFIC.

THIS ENGRAVING represents a new Iron Frame, 80-Ton, Low Down, Hydraulic Wheel Press, used by wheel, carriage, wagon, truck, and artillery vehicle builders, for pressing boxes into the wheel's hub, and pressing on the bands and flanges.

IT IS BUILT low down so that heavy wheels can be quickly and easily placed into the machine, the head of ram standing but 26″ from the floor when the ram is at its lowest position.

THE FRAME, of iron, is heavy and substantial throughout. It has been designed to overcome the tendency to spring, and to accommodate the heaviest work now required of this class of machinery, and to secure a positive and steady pressure whereby the work can be performed accurately.

ITS CAPACITY is sufficient to receive wheels up to 63¼″ diameter, and sizes smaller, and it will take 21″ between the head of screw and top of ram.

THE ADJUSTING SCREW, as shown above the ram head, is of 5″ steel, and fitted with a hand-wheel to bring the end of screw quickly down to the work, whereby the operator can instantly adjust the machine for short or long hubs without the use of blocking for filling in, and the pressure is applied to the work instantly upon starting the pumps.

THE DOUBLE PUMP is constructed of phosphor bronze, and it is of the most improved and substantial kind. Unlike others, it will not get out of order. It is located within the liquid reservoir attached to the base of the main frame, close up to the cylinder, which secures immediate action to the ram in starting the pumps. A detachable lid covers the liquid and pumps to protect them from dust and dirt.

THE HYDRAULIC RAM is placed within the lower cross beam, and the liquid is delivered to it through hydraulic tubing. The relief pipe is extra large to accommodate a quick return motion to the ram in backing down.

THE SAFETY VALVE can be adjusted to blow off at any desired pressure, acting as a safeguard. It will instantly relieve the pressure from the ram, and discharge the liquid back into the reservoir, should the pressure at any time exceed the amount required.

THE PRESSURE GAUGE is inclosed within a highly finished brass case, and it designates the amount of pressure applied to the ram in tons and per square inch.

THE LIQUID used should be free from grit and other foreign substances. Light engine oil is preferred although crude petroleum or other oils of this nature will answer.

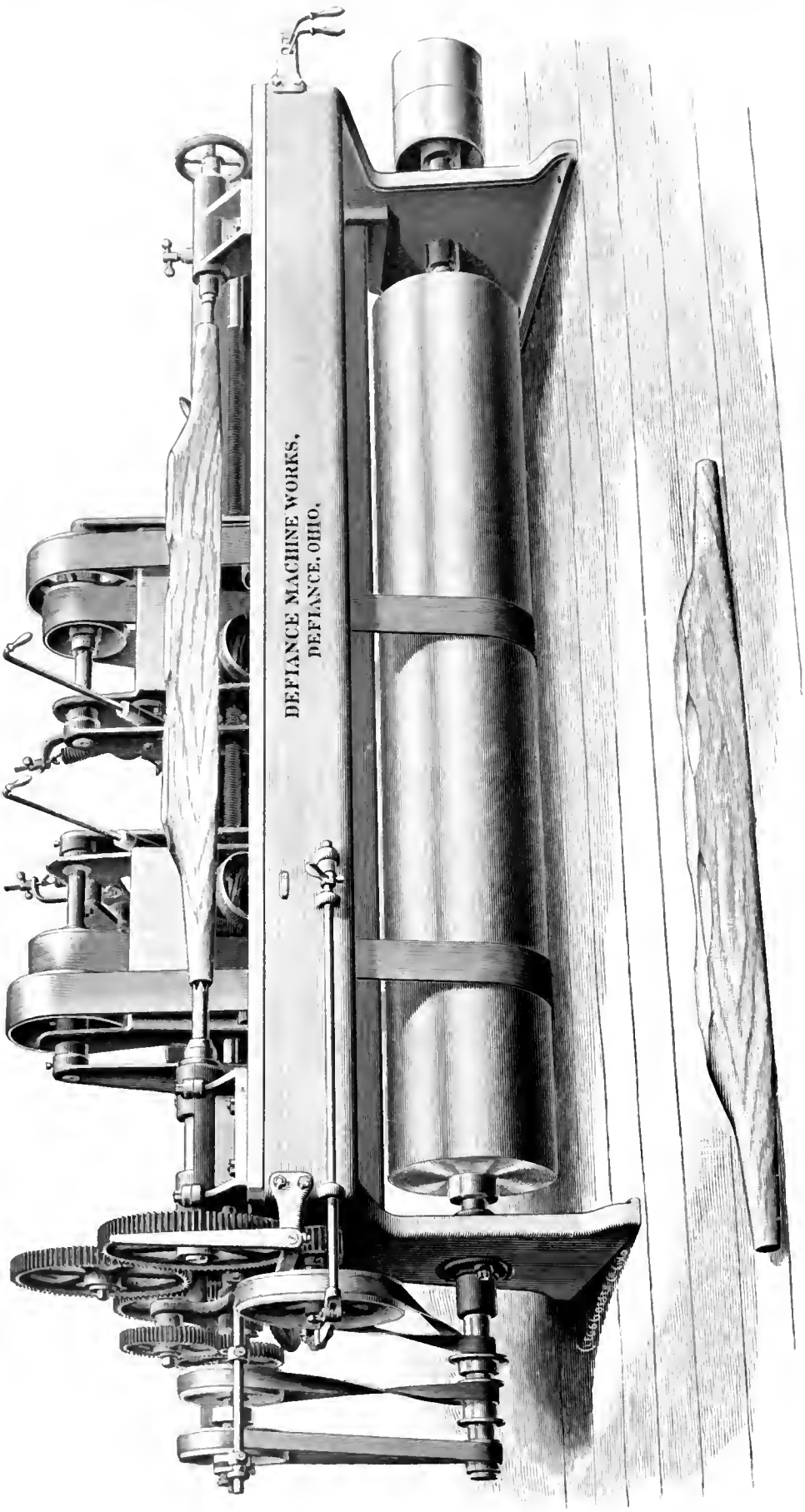
THE FRICTION COUNTER is fitted to a 3″ steel shaft on top of the main frame out of the way, and driven by a 4″ belt to operate the pumps. This counter can be attached to the machine as shown by the engraving, standing horizontally in line with the main frame, or transverse at right angles, as might be ordered, to suit best the requirements.

THE OPERATOR has complete control over the machine, starting or stopping instantly, and regulating the pressure from 0 to 80 tons by a slight movement of the lever, which engages or disengages the friction pulley. When disengaged the friction wheel acts as a loose pulley.

THE MACHINE is tested at 100 tons pressure.

THE FRICTION PULLEY is 24″ diameter, 4″ face, and should run 450 rotations per minute. It can be belted to from above, below, or either side; pulley for main line should have 4″ crowning face.

HORSE POWER to drive, 1; floor space occupied, 48″×96″×96″ high.



No. 1 Patent Automatic Double Head Axletree Turning Lathe.

Export Shipping Weight, 6,200 Pounds.
Net Weight, 5,000 Pounds.
Cubic Measurement, 260 Feet.
Cable Word, LANSING.

No. 1 Patent Automatic Double Head Axletree Turning Lathe.

Export Shipping Weight, 6,200 Pounds.
Net Weight, 5,000 Pounds.
Cubic Measurement, 260 Feet.
Cable Word, LANSING.

THIS MACHINE is designed for turning from patterns all kinds of irregular forms, such as wagon axles, bolsters, sand boards, rockers, ox yokes, axe handles, whiffletrees, gunstocks, spokes, and other similar articles. It has been constructed from entirely new designs, and embraces important labor saving features, which increases both the quantity and quality of the work. It is massive and heavy, built of iron and steel throughout, designed for the hardest service, and, being fitted with two cutter heads, and with all the parts exceedingly strong, it is capable of doing better and double the amount of work over the old style single head machine.

THE CUTTER HEADS are mounted on separate carriages traversed upon planed ways across the path of material to be turned by means of a heavy screw; the small hand lever, as seen attached to each carriage, is used for bringing the cutter heads up to the work, or locking them back out of the way when not in use. The heads can be used together or independently as desired; for long turning, such as axles, etc., both are used at one time, one commencing the cut at the end and the other in the center of the material to be turned; each feeding half way over the material completes it; they feed from right to left, and left to right, thus avoiding loss in time, and the machine is prepared to commence the cut at either end of the stick. When but one head is used for short turning, the other can be quickly disconnected from screw by opening a split nut which connects them. It will be observed that the knives cut on the under side of the material, discharging the chips downward, and greatly lessening the liability of the operator being injured.

THE FEED is very powerful and automatic in its action, stopping instantly when the end of the cut is reached.

THE TAIL STOCK is fitted to the top of the frame, which is planed true, and it is always in perfect alignment with the head center, and it can be quickly adjusted horizontally to or from the head center for short or long turning.

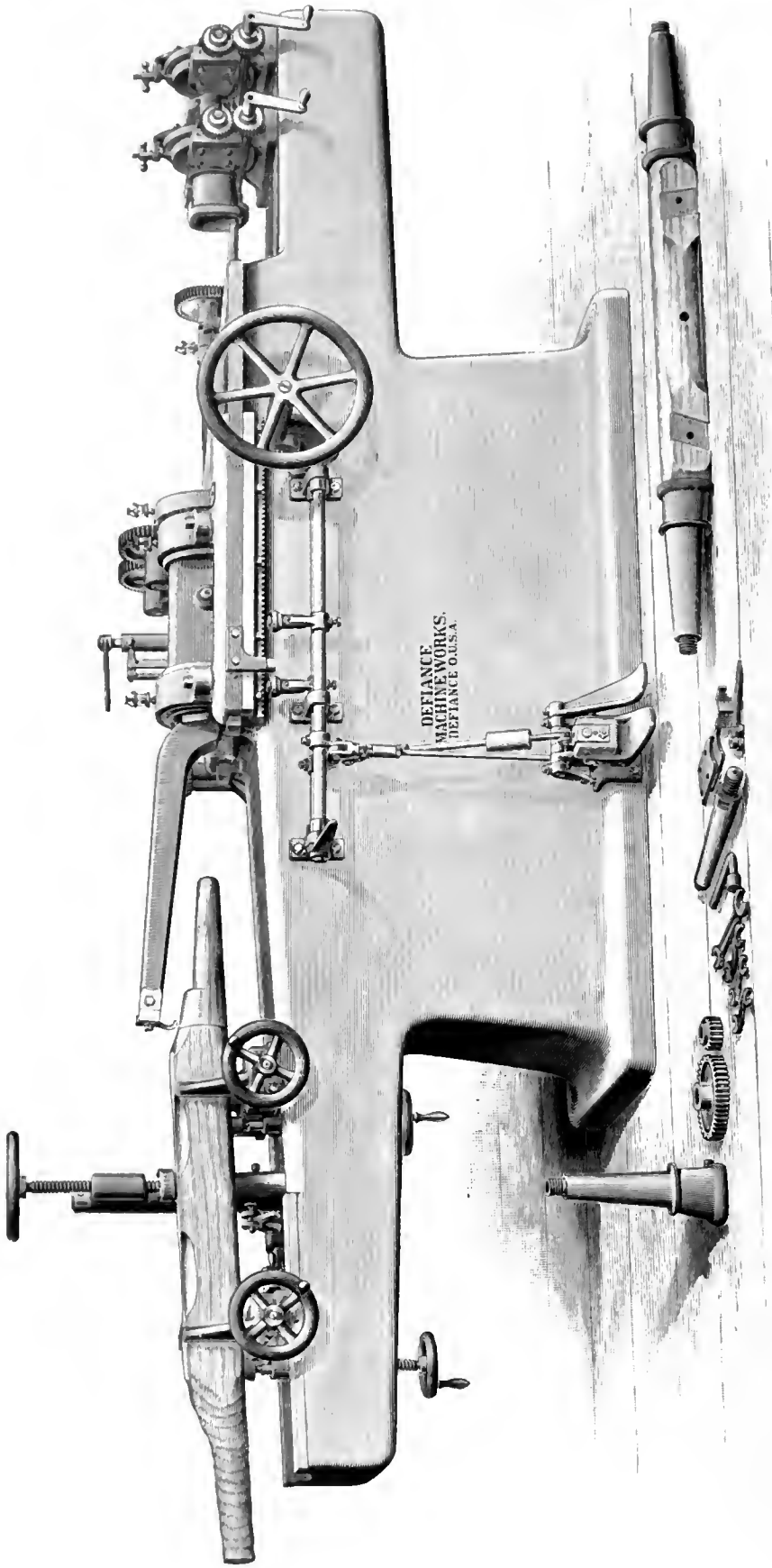
THE PATTERN, which guides the path of the cutter heads and governs the shape of turning, is placed upon centers at the rear portion of the machine, and it should be an exact duplicate of the shape desired to turn, but the size of the article turned may be varied either larger or smaller from the same pattern.

THIS MACHINE works perfectly in hard seasoned timber, turning the work smooth, and producing perfectly square corners without tearing, and it is extremely simple to operate; all the gearing is cut and the working parts accurately fitted.

IT WILL TURN material 6 feet long and shorter, from 8″ diameter and smaller.

THE COUNTER is now furnished independent of the machine to attach to the ceiling, in order to use longer belts than shown in the engraving. The countershaft is 12 feet 3″ long, $2\frac{7}{16}$″ diameter; two No. 6 heavy drop hangers; special drum; tight and loose pulleys are 10″×6″; speed, 450 turns per minute.

HORSE POWER to drive, 5; floor space occupied, 48″×150″



No. 2 Patent Automatic Skein Setting and Fitting Machine.

Export Shipping Weight, 7,500 Pounds.
Net Weight, 6,000 Pounds.
Cubic Measurement, 340 Feet.
Cable Word, SPEARING.

No. 2 Patent Automatic Skein Setting and Fitting Machine.

Export Shipping Weight, 7,500 Pounds.

Net Weight, 6,000 Pounds.

Cubic Measurement, 340 Feet.

Cable Word, SPEARING.

THIS ENGRAVING represents our No. 2 Patent Automatic Skein Setting and Fitting Machine, which has been designed for the use of wagon and truck builders to turn the ends of wooden axles to the proper size and shape to fit the interior of either large or small cast iron or steel skeins used thereon.

SPECIAL ATTENTION is called to the large and heavy frame or bed of the machine. By this design, to which we have given more than usual care, all tendency to twist or spring the bed out of alignment is defeated, and an easy, uncramped movement of the working parts secured, thereby increasing the capacity over other machines in the market, and very much improving the quality of the work.

THE CUTTER BAR, of heavy forged steel, is fitted at the rear end with a friction roller which traverses the inner circle of the skein to be fitted; the opposite end is provided with an adjustable cutter. The cutter bar oscillates upon a heavy steel spindle running at right angles through its center, which connects it with a heavy circular sleeve that revolves in large bearings mounted upon a sliding carriage, having extra long bearings, which are gibbed to the top of the main frame of the machine, having a horizontal movement by screw feed to accommodate the largest skein. The cutter bar is rotated by cut gearing, and a double friction clutch so arranged that a high speed to the cutter is obtained when cutting the round portion of the axle, and when the cut reaches the oblong shape near the mouth of the skein, the speed to the cutter is automatically reduced. When the end of cut is reached the machine stops automatically and the opening of a split nut on the screw feed is self-released for the return of the carriage for the next cut.

THE AXLE to be operated upon is held in the machine by self-centering jaws propelled by right and left hand screws and a swinging screw clamp which can be moved out of the way when putting in or taking out the axle. A novel device is used for securing the proper amount of gather without the use of a rule or any guesswork on the part of the operator.

THE SKEIN is held at the other end of the machine in self-centering adjustable jaws open on top and operated by cut gears and right and left hand screws so arranged to hold accurately skeins of any size or kind.

IN OPERATING, the skein and axle are placed into the machine, as shown by the engraving, and the carriage carrying the cutter bar is moved backward with the friction roll attached to the bar inside of the skein. When the friction clutch is engaged by the weight of the operator's foot on the pedal, the cutter bar instantly revolves and feeds into the cut. The friction roller follows the inside shape of the skein which governs the path of the cutter and turns the end of the axle to an exact duplicate of any skein placed into the machine. The change of speed to the cutter from the round to the oblong portion of the cut, stopping the machine, opening of the feed nut, are all automatic in their movements, requiring no attention on the part of the operator. All the gears and working parts are outside of the main frame and are easily accessible.

THE FRICTION COUNTER is a part of the machine; it can be belted to from above or below. It consists of two friction belt pulleys 16″ diameter, 4¼″ face; speed of inside friction, 300 revolutions; speed of outside friction, 400 revolutions per minute.

HORSE POWER to drive, 3; floor space occupied, 64″×128″.

No. 1 Improved Axle Shoulder Shaping Machine.

Export Shipping Weight, 1,000 Pounds.

No. 1 Improved Axle Shoulder Shaping Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 44 Feet.

Cable Word, SUCCESS.

THIS ENGRAVING represents our new No. 1 Axle Shoulder Shaping Machine, which has been designed for the use of wagon manufacturers for dressing the shoulder of wooden axles, that portion which cannot be reached with the Skein Setting and Fitting Machine, beyond the mouth of the skein.

THIS WORK, previous to the introduction of this machine, has been accomplished entirely by hand labor, making it slow and expensive. By this new machine each cut is made alike, true and smooth, so that no hand finishing is required, and it will do the work of at least ten men, and do it 50 per cent. better.

THE FRAME is a heavy casting in one piece with cored center. The arbor, of steel, runs in genuine babbitt metal bearings, with a pulley attached to one end and the cutter head to the other end. Immediately behind the cutter head a cam is attached to the frame against which the axle rotates while being operated upon, thus dressing the shoulder of axle to conform with the shape secured with the Skein Setting and Fitting Machine at the mouth of the skein and gradually running out the cut. Two widths of cutter heads are furnished for a short or long cut, as shown by the engraving. Suitable rests are provided for by which to support the work.

THE AXLE to be shaped is placed into the machine between the cup and V-shaped rest and revolved by hand against the cam and cutters. A single rotation completes the work. So quickly is the operation performed that the operator of the Skein Setting and Fitting Machine has ample time to run this machine. For steel skeins a brass fork is used to support the end of the axle instead of the cup, so that the long cut can be made at bottom of axle.

THE COUNTER is furnished as follows: Shaft, $36'' \times 1\frac{1}{16}''$; two No. 1 adjustable drop hangers; driving pulley, $20'' \times 4''$; tight and loose pulleys, $10'' \times 4''$; speed, 800 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, $24'' \times 72''$.

No. 2 Double Spindle Axle Shoulder Shaping Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 30 Feet.
Cable Word, SENDAZ.

No. 2 Double Spindle Axle Shoulder Shaping Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 30 Feet.
Cable Word, SENDAZ.

THIS ENGRAVING represents our No. 2 Improved Double Spindle Axle Shoulder Shaping Machine, which has been especially designed for the use of wagon builders for dressing the shoulder of wooden axles, that portion which cannot be shaped with a Skein Setting and Fitting Machine, beyond the mouth of the skein. Previous to the introduction of this machine this work was accomplished entirely by hand labor, which was a slow and expensive operation. By the use of this new machine each cut is made alike, true and smooth, entirely avoiding hand finishing, and producing work equal to that of a dozen men and doing it much smoother and better.

THIS MACHINE is intended to cover the same class of work as our No. 1 Improved Axle Shoulder Shaper, and differs only in having two cutter head spindles, which have been demanded by the larger wagon manufacturers who use both cast iron and steel skeins. One spindle is fitted with a cutter head for cast skeins and the other for steel skeins, thus saving the time and trouble of changing heads for the different kinds of work, which is necessary with a single spindle machine.

THE FRAME of this machine is of a neat design, cast in one piece, with cored center. The spindles of steel run in large genuine babbitt metal, self-lubricating bearings, with the driving pulleys attached to the rear end, and the cutter heads fitted to the other end. Immediately behind the cutter heads a cam is attached to the frame of the machine against which the axle rotates while being shaped, thus dressing the shoulder of the axle to correspond with the finished portion at the mouth of the skein as shaped by the Skein Setting and Fitting Machine, gradually running out the cut to a neat finish. The heads are covered with adjustable shields to protect the operator and to discharge the shavings at the base of the frame.

THE AXLE to be shaped is placed into the machine between suitable guides and revolved by hand against the cams and cutters. A single rotation completes the work. So quickly is the operation accomplished that the operator of the Skein Setting and Fitting Machine can easily handle it.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 44''$; two No. 1 adjustable ball and socket drop hangers; two driving pulleys, $20'' \times 4''$; tight and loose pulleys, $10'' \times 5''$; speed, 800 turns per minute.

HORSE POWER to drive, 2; floor space occupied, $26'' \times 72''$.

No. 1 Improved Lag Screw Boring and Driving Machine.

Export Shipping Weight, 1,600 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 64 Feet.
Cable Word, BAZEN.

No. 1 Improved Lag Screw Boring and Driving Machine.

Export Shipping Weight, 1,600 Pounds.

Net Weight, 1,100 Pounds.

Cubic Measurement, 64 Feet.

Cable Word, BAZEN.

THIS ENGRAVING represents our No. 1 Lag Screw Boring and Driving Machine, which has been designed for the use of wagon builders for boring the end of wooden axles, and driving therein the lag screws. Previous to the introduction of this machine it required two machines and two operators, one for drilling and the other for driving, all of which is now accomplished at one setting of the axle and by one operator who should also handle successfully the Hydraulic Skein Pressing Machine.

THE FRAME is a substantial casting in one piece with cored center. It is very stiff and reliable and of neat design.

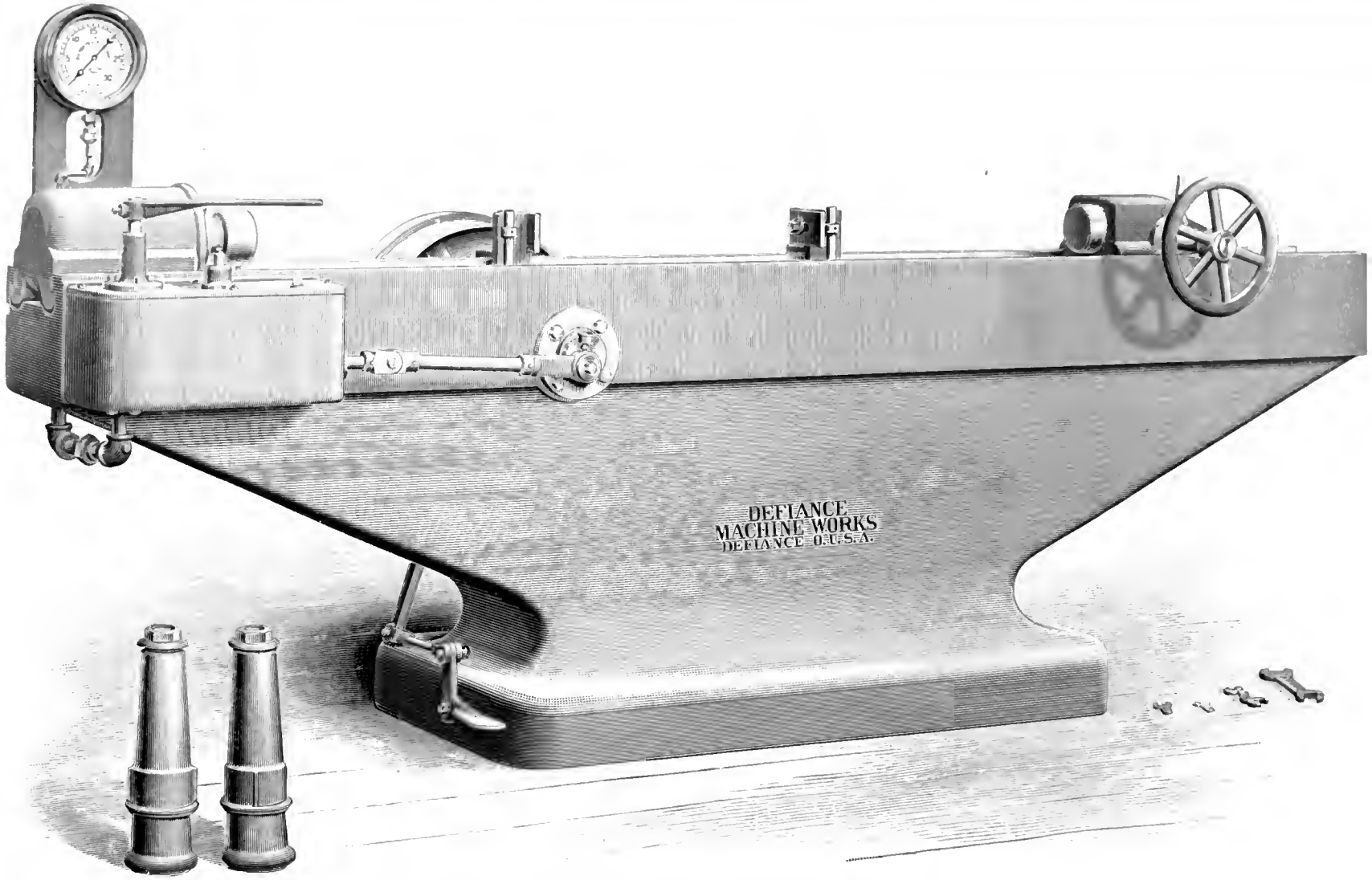
THE BORING AND DRIVING SPINDLES are arranged side by side in large bearings. The boring spindle is fitted with a twist drill, the driving spindle is fitted with a steel face plate containing a square hole to receive the head of a lag screw, and it is driven by cut gearing.

THE CARRIAGE which supports the axle is gibbed to the main frame and it moves in a horizontal plane to and from the spindles by turning the large hand-wheel. It is also provided with a right angular adjustment to bring the axle central with either the boring or driving spindles; as well it is provided with a rotary adjustment to reverse the ends of the axle without loosening it from the jaws. The axle is gripped by a two-jawed chuck propelled by a right and left hand screw. The back end of the axle rests upon an adjustable gauge.

IN OPERATING, the axle is placed between the jaws and central with the boring bit, and the boring is performed, after which the table is moved over by hand central with the driving spindle, in which position the lag screw is driven. The jaws, having a planetary movement, are then reversed and the opposite end of the axle treated in like manner. Thus both ends are completed at one setting, and the laborious work of lifting the axle to reverse ends is avoided.

THE COUNTER is furnished as follows: Countershaft, $1\frac{7}{16}''$ diameter by 40" long; two No. 1 adjustable hangers; tight and loose pulleys, $10'' \times 4''$; driver for auger spindle, $16'' \times 3''$; driver for driving spindle, $5'' \times 3''$; speed, 500 rotations per minute.

HORSE POWER to drive, 1; floor space occupied, $30'' \times 93''$.



30-Ton Hydraulic Skein Pressing Machine.

Export Shipping Weight, 4,000 Pounds.

Net Weight, 3,300 Pounds.

Cubic Measurement, 119 Feet.

30-Ton Hydraulic Skein Pressing Machine.

Export Shipping Weight, 4,000 Pounds.

Net Weight, 3,300 Pounds.

Cubic Measurement, 119 Feet.

Cable Word, POSITIVE.

THIS ENGRAVING represents a new 30-Ton Hydraulic Press especially designed for pressing skeins upon wagon axles. It is of modern design and embraces many new features for the saving of labor and increasing the quality and quantity of the work. Previous to its introduction this work was accomplished by hand, which proved slow and expensive, fractured and imperfectly set skeins being the result. Screw presses have also been employed, but they were found slow, clumsy, and awkward to handle, and the steady pressure required for accurate work could not be obtained.

IN THIS MACHINE special attention is called to the massive frame or bed. By this design, to which special care has been given, no unnecessary room is occupied, and all tendency to spring the bed out of alignment is defeated. The top surface is planed true, and accurately fitted for the support of the working parts.

THE PUMP, of phosphor bronze, is conveniently located close to the cylinder to secure instant action to the ram when the pump is started, and it is driven by a friction clutch, which is connected by a foot treadle, as shown at the base of the machine, for starting or stopping the pump.

THE CYLINDER is of steel, and the liquid for operating the ram is delivered to it through hydraulic tubing. The relief pipe is extra large, to secure a quick return movement to the ram in backing off.

THE SAFETY VALVE is located within the liquid reservoir, and it can be set to blow off at any desired pressure. It will instantly relieve the pressure from the ram when excess pressure is applied, and discharge the liquid back into the reservoir.

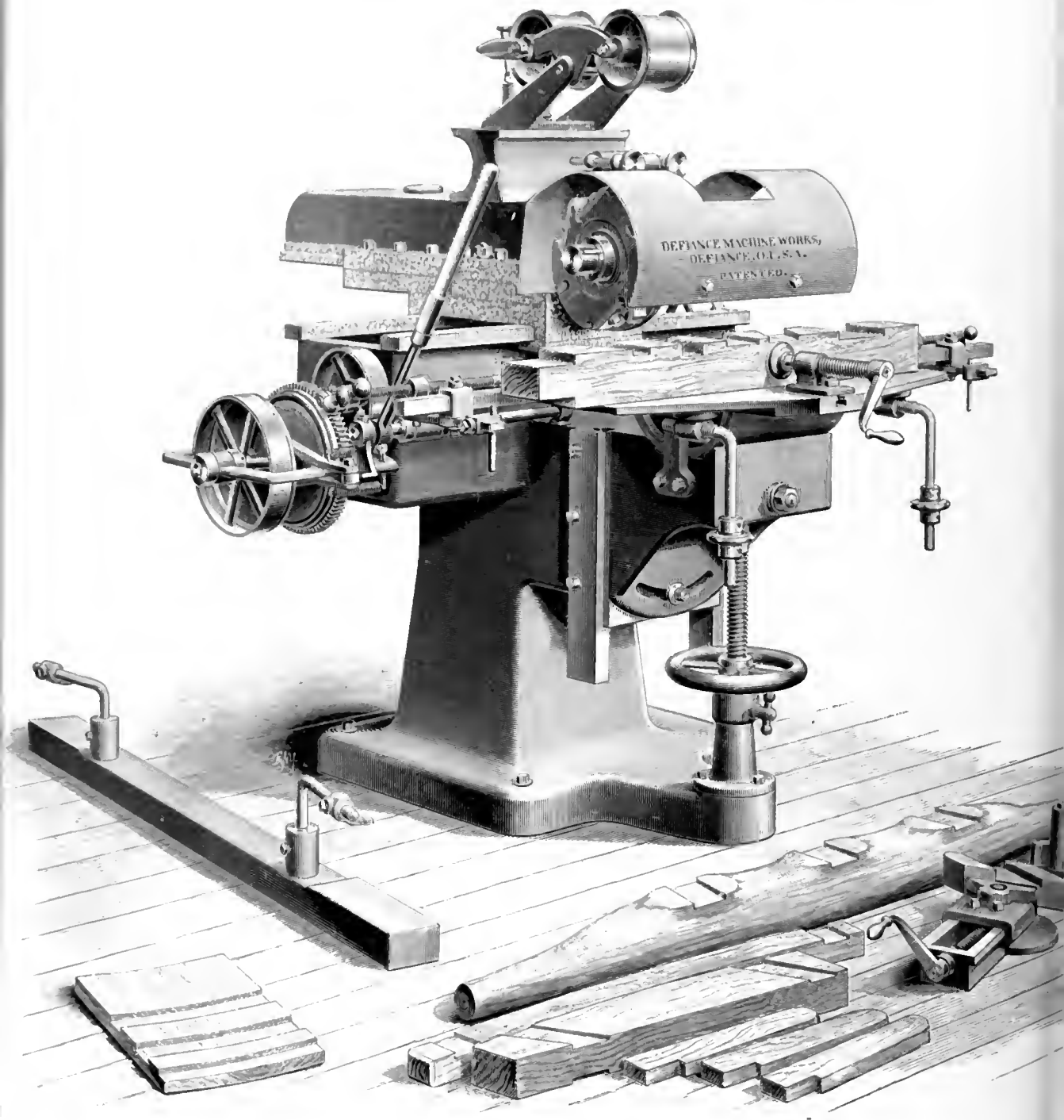
THE TAIL STOCK slides on top of the bed, and it can be quickly set the required distance from the ram head by the hand-wheel shown, to accommodate a short or long axle, and it is automatically locked at any point to resist the pressure of the ram. A pair of adjustable gauges are fitted to the top of the bed, upon which the axle is laid central with the ram and tail stock, requiring no care on the part of the operator to properly place the work into the machine.

THE FRICTION CLUTCH is located at the rear of the machine, out of the way, and it can be instantly engaged to start the pump by the weight of the operator's foot upon the treadle. When the foot is removed the frictions are automatically disengaged, the friction acting as a loose pulley.

THE LIQUID used should be free from grit or other foreign substances. Light engine oil is preferred, although crude petroleum, or other oils of this nature, will answer.

THE FRICTION PULLEY is 18″ diameter, 4″ face; speed, 250 rotations per minute. It can be belted to direct from the main line from a pulley with 4″ crowning face.

HORSE POWER to drive, 1; floor space occupied, 30″ × 122″.



No. 1 Patent Single Head Automatic Gaining Machine.

Export Shipping Weight, 3,400 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 120 Feet.

Cable Word, GRAND.

No. 1 Patent Single Head Automatic Gaining Machine.

Export Shipping Weight, 3,400 Pounds.

Net Weight, 2,800 Pounds.

Cubic Measurement, 120 Feet.

Cable Word, GRAND.

THIS ENGRAVING represents a most complete and convenient Patent Single Head Automatic Gaining Machine, especially designed for carpenters, car and ship builders, wagon, truck, carriage, agricultural implement manufacturers, and general wood-workers, for cutting gains, grooves, tenons, and miters, either square, angular, or double angular, in either hard or soft wood, from the most delicate sizes up to 8″ wide, 3″ deep, and from 1″ to 24″ long, and performing the work true and smooth, without slivering. Cutter heads can be used for any class of work in this line, or by the use of a cut-off saw it can be utilized for cutting off timber with equal success.

IT IS adapted for cutting gains or grooves of an equal depth over the surface of warped boards, as shown by the sample of work at the base of the machine.

THE MAIN FRAME is a heavy casting in one piece with cored center and broad base; the top portion of the frame is planed true and accurately fitted for the support of the carriage, which is gibbed to it and adjustable over its entire length by a convenient hand wheel and screw to adjust the head to any portion of the work without moving the work on the table.

THE CUTTER HEAD SPINDLE, of steel, is $1\frac{5}{16}$″ diameter, 24″ long. The cutter head may be used on either end, or one at each end of the spindle to cut two gains at one time, or placed between the bearings with the driving pulley outside, as may best suit the nature of the work.

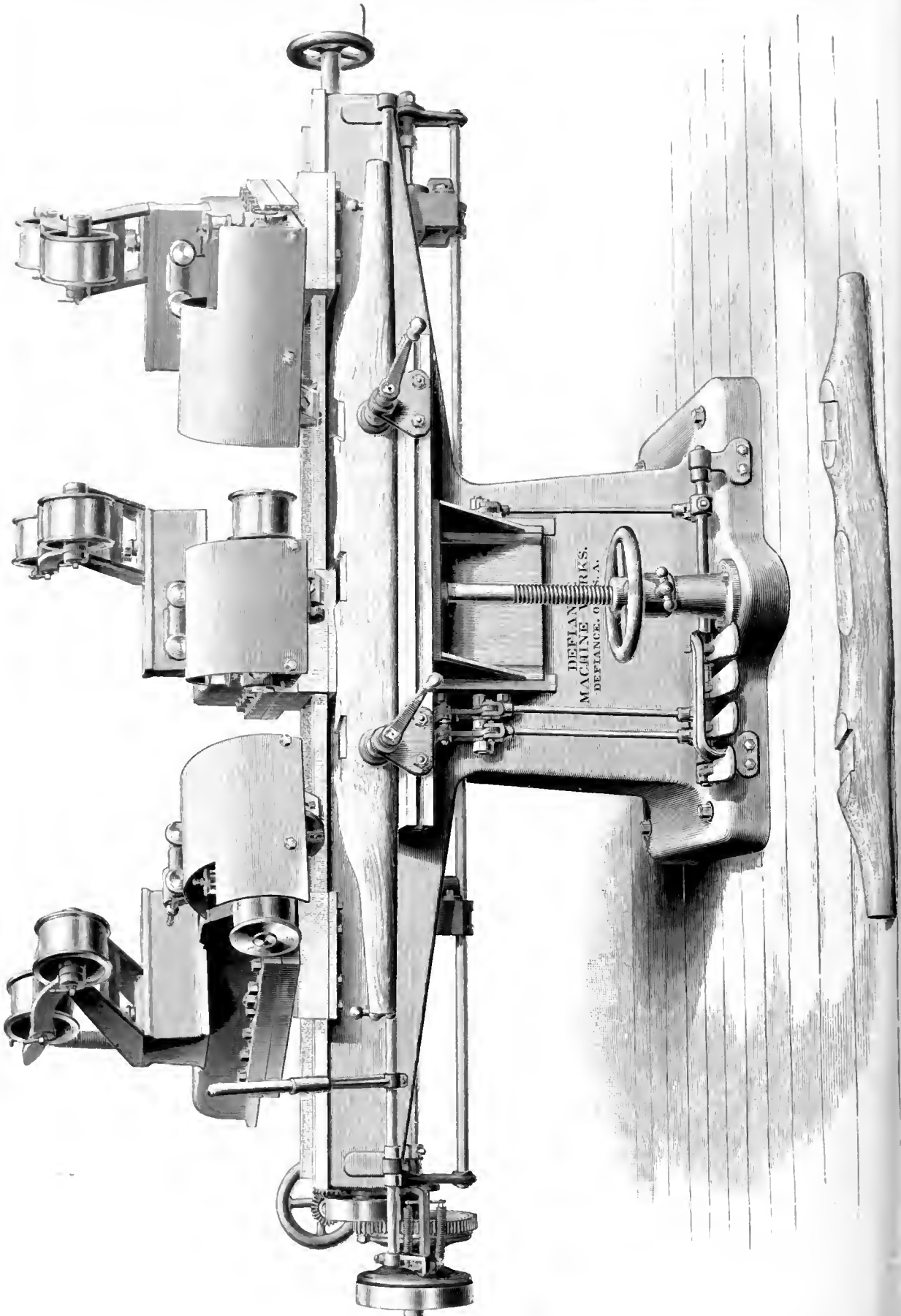
THE SLIDING RAM by which the cutter head is carried is fitted with a novel device whereby the travel of the head may be instantly governed from 1″ to 24″ stroke, and it is provided with a quick return movement after completing the cut. The ram can be set to any desired angle for the purpose of cutting angular gains.

THE TABLE BRACKET is fitted to the frame in gibbed ways and adjustable up or down by a heavy hand wheel and screw to regulate the depth of cut. The table proper is provided with a screw clamp for holding large work, and a small chuck, as shown at the base of the machine, for short work. The table may be tilted from side to side or from end to end in either direction, forming a universal adjustment for any required straight or angular gains, and it is supplied with an index so that it can be accurately adjusted to any degree angle without the use of a rule.

THE ATTACHMENT shown at the base of the machine is used to accurately center a wagon axle by its skeins when cutting hound and reach gains.

A COUNTER is furnished as follows: Shaft, 6 feet 6″ long by $1\frac{5}{8}$″ diameter; two No. 2 ball and socket adjustable drop hangers; two driving pulleys, 16″ × 12″ with split hubs; pulley to reverse feed, $3\frac{1}{2}$″ × 3″; one flange on shaft to guide feed belt, which is driven from shaft; tight and loose pulleys, 10″ × 6″; speed, 750 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, 55″ × 66″.


DEFIANCE
MACHINE WORKS.
DEFIANCE, O. U. S. A.

No. 2 Patent Three Head Automatic Gaining Machine.

Export Shipping Weight, 6,000 Pounds.

Net Weight, 5,000 Pounds.

Cubic Measurement, 260 Feet.

Cable Word, GOVERN.

THIS ENGRAVING represents our No. 2 Patent Three Head Automatic Gaining Machine, which is calculated to supply a demand long unsatisfied, for the gaining of all kinds of wagon gearing and a large variety of light and heavy framing; much careful study has been expended on the ease and precision of its operation.

THE FRAME is very substantial; it is cast in one piece, with cored center; the top is planed true and accurately fitted for the support of the carriages, which are gibbed to it, and adjustable to or from each other by separate hand-wheels, accommodating an adjustment sufficient to cut gains up to 7 feet apart.

THE UPPER PORTION of each carriage is adjustable on a turntable base so as to admit of being set at any angle desired for the purpose of cutting angle gains.

THE TRANSVERSELY SLIDING RAMS, by which the cutter heads are carried, may be brought forward to the work separately or simultaneously by the use of the foot pedals at the base of the machine, according to the desire of the operator; the amount of travel to the rams may be governed instantly from 1″ to 24″, and they are provided with a quick return movement after completing their work.

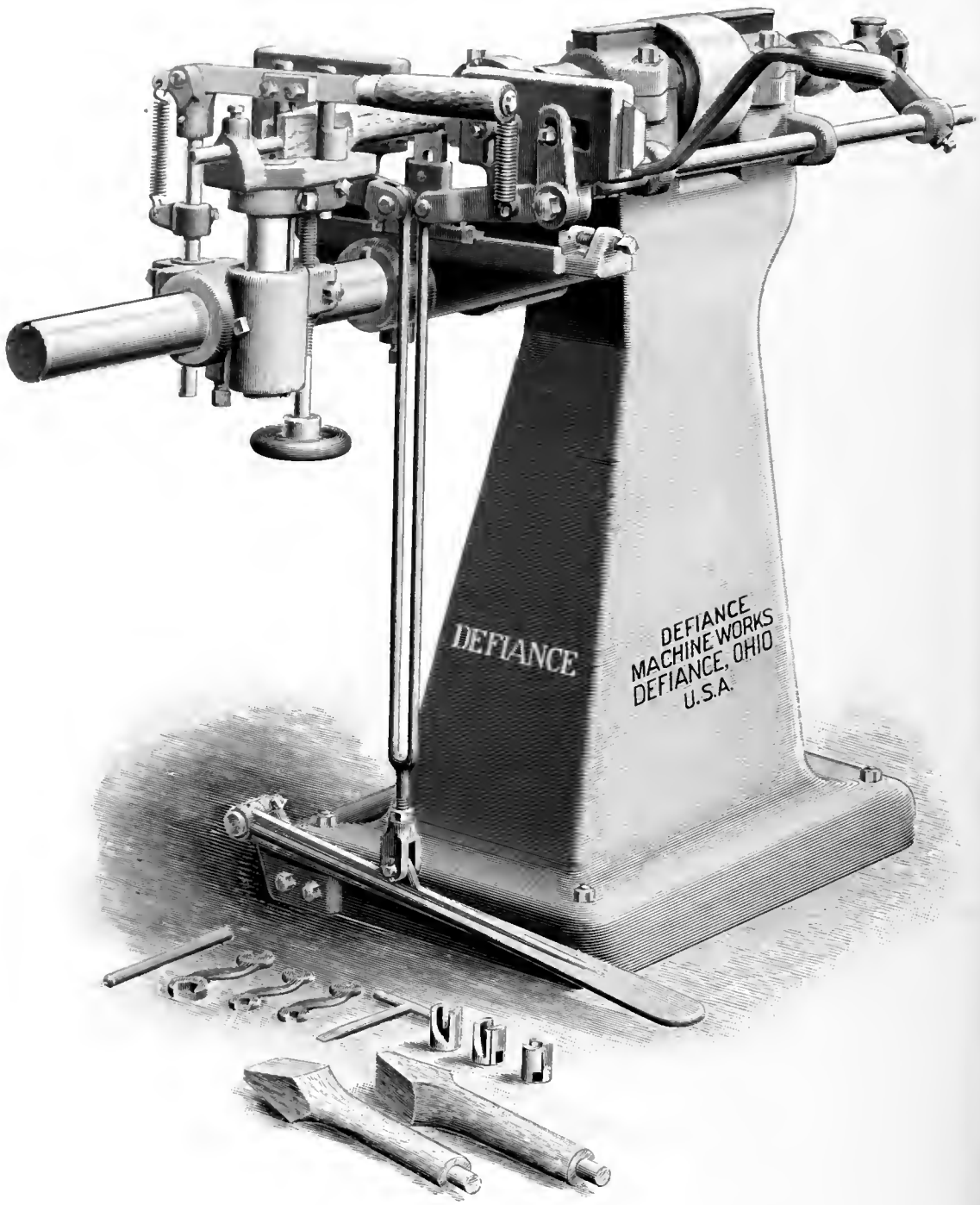
CUTTER HEADS can be furnished to cut any required width or depth; each headstock by which the cutter head is held is furnished with a novel device by which the surface of a warped board may be faithfully followed in cutting gains or dados in wide, uneven lumber, thus making it possible to effect an accurate gauge for the depth of the cut. In gaining heavy timber, wagon, or carriage gearing, this device serves to lock the headstock in a rigid position, gauging the cut from the bottom of the stick; each headstock is furnished with the means to gauge its respective depth of cut without reference to the other heads, or to the height of the table.

AN ATTACHMENT, not shown in the engraving, is furnished to accurately center and securely hold a wagon axle lengthwise with reference to its skeins.

SPECIAL ATTENTION is called to the large and heavy frame or bed of the machine. By this design, to which we have given more than usual care, all tendency to twist or spring the bed out of alignment is defeated, and an easy, uncramped movement of the working parts secured.

THE TIGHT AND LOOSE PULLEYS on the counter are 12″ diameter by 6″ face, and should run 750 turns a minute; three No. 2 hangers; three 16″ × 12″ straight face driving pulleys; one pulley for reversed feed, 3½″ × 3″; flange on countershaft to guide feed belt, which is driven from shaft.

HORSE POWER to drive, 3; floor space occupied, 60″ × 108″.



No. 98 Patent Automobile Spoke Tenoning Machine.

Export Shipping Weight, 1,100 Pounds.

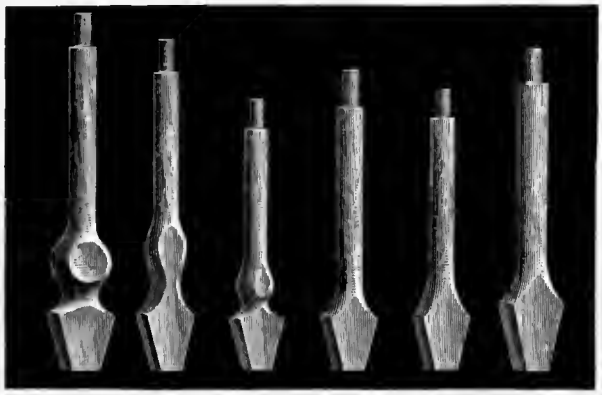
Net Weight, 800 Pounds.

Cubic Measurement, 35 Feet.

Cable Word, TOUQUES

No. 98 Patent Automobile Spoke Tenoning Machine.

Export Shipping Weight, 1,100 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 35 Feet.
Cable Word, TOQUES.



THE ENGRAVING on opposite page represents our No. 98 Patent Automobile Spoke Tenoning Machine, especially designed for cutting tenons on the felloe end of spokes used in the construction of automobile and artillery wheels. It will produce with accuracy a straight, round tenon with square or round corners; or tenons of two diameters on the same spoke with one or both shoulders, or corners round or square of various diameters and lengths.

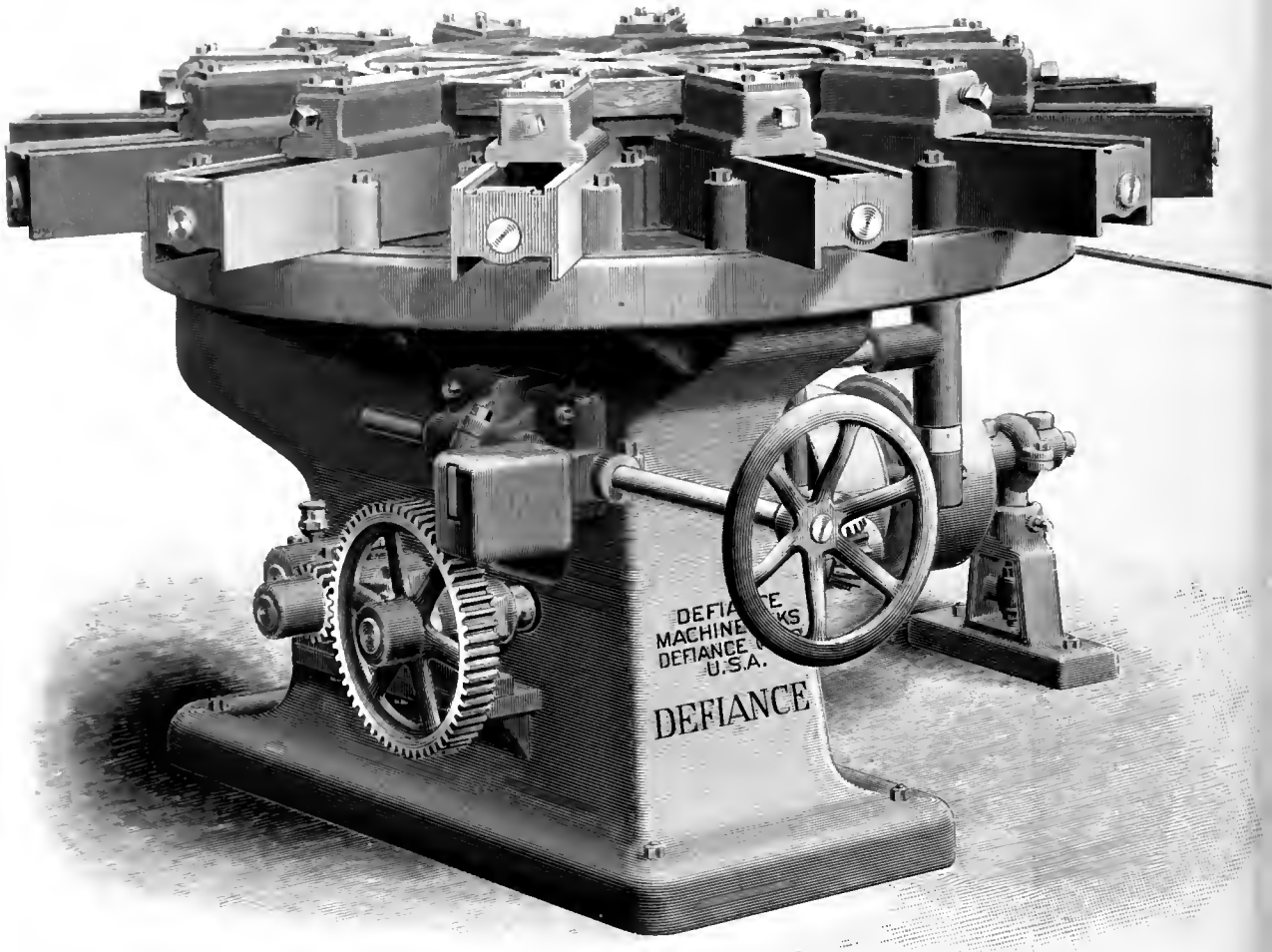
THE WORKING PARTS are mounted upon a substantial iron frame in one piece with a broad floor base to overcome vibration.

THE CUTTER HEAD SPINDLE of ground steel slides into a splined sleeve, which rotates in large self-lubricating bearings, and it is provided with suitable stops for gauging the length of tenon. The cutter head employed is our well known Acme Patent type containing adjustable cutters, which can be quickly set to cut tenons of various diameters. A convenient hand lever is used to bring the head up to and from its work.

THE SPOKE is firmly held true with the cutter head, the miter or hub end resting upon an adjustable table between adjustable gauges, while the other end is clamped between self-centering jaws, requiring no skill on the part of the operator to place the spoke into the machine. It will cut tenons parallel with the barrel of the spoke or at an angle with the face sides, and produce spokes that will measure an exact distance from the shoulder of the tenon to the miter, which is a very important feature in good wheel building. It will cut tenons on about 4,000 spokes in ten hours, and it is easily adjusted for spokes of different lengths and sizes.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$″ diameter, 44″ long; two No. 1 adjustable ball and socket drop hangers; one driving pulley, 20″ × 4″; tight and loose pulleys, 12″ × 5″, with the loose pulley fitted with bronze bearings; speed, 720 rotations per minute.

HORSE POWER to drive, 1½; floor space occupied, 57″ × 23″.



No. 198 Automobile Wheel Assembling Machine.

Export Shipping Weight, 4,600 Pounds.

Net Weight, 4,000 Pounds.

Cubic Measurement, 124 Feet.

Cable Word, ANDELLE.

No. 198 Automobile Wheel Assembling Machine.

Export Shipping Weight, 4,600 Pounds.
Net Weight, 4,000 Pounds.
Cubic Measurement, 124 Feet.
Cable Word, ANDELLE.

THIS ENGRAVING represents our new No. 198 Automobile Wheel Assembling Machine, used by the builders of automobile wheels for rapidly and accurately assembling or pressing firmly together the felloes and spokes and attaching the false hub, and preparing the wheel for the Automobile Wheel Sizing Machine No. 298.

THIS MACHINE is built extremely stiff and powerful to withstand the heavy and accurate work expected of it. The frame is a massive casting in one piece with an exceedingly heavy geared and screwed chuck mounted upon it.

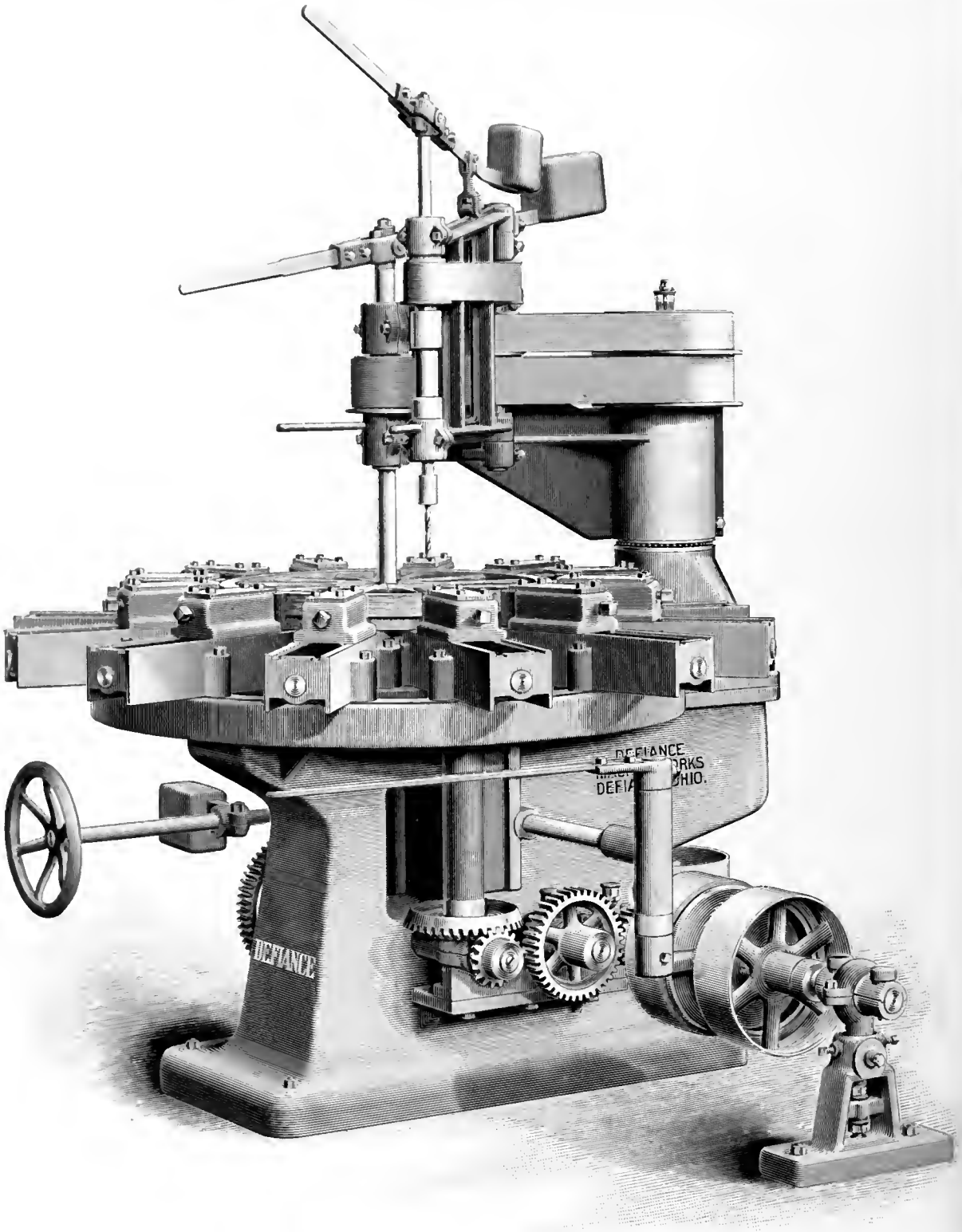
THE STOCK from which motor car wheels are assembled by this machine should be accurately prepared. The spokes and rims finished complete are placed into the chuck, the jaws of which are simultaneously brought up to the work, which is pressed together tightly and held in that position until the false hub is properly attached, after which the jaws retreat from the work with a quick return motion.

THE CHUCK is universal and fitted with a number of jaws, all of which are actuated simultaneously by cut gears, screws, and a double friction clutch. A convenient hand lever is provided for throwing the frictions from right to left to open or close the jaws, or to an intermediate position for arresting their movement, the operator having instant control over the movement of the jaws from the working side of the machine; securing and holding any pressure required on the wheel while attaching the false hub, which consists of two flanges, one of which has a projecting hub with threaded end, the other tapped to suit it. The flange with the hub is placed into the machine before placing the spokes and rims in the chuck, and it rests upon the end of an upright spindle having a vertical adjustment by the hand wheel shown. After the wheel has been assembled the lower flange is brought up, with the hub extending through the wheel central with its felloe, after which the top flange is firmly screwed to it, clamping the flanges tightly against the sides of the spokes and holding them in this position until after the metal tire has been placed on the felloe. Then the false hub is removed and the permanent hub substituted in its stead.

ALL THE WORKING PARTS are accurately fitted, the principal bearings of bronze with self-lubricating devices; all the sliding surfaces are scraped to a bearing and the gears are cut from the solid.

THE COUNTER: Shaft, $1^{15}/_{16}'' \times 52''$; one driving pulley, $10'' \times 4\frac{1}{2}''$, for driving the plungers to the work; one driving pulley, $16'' \times 4\frac{1}{2}''$, for quick return movement to the plungers; two floor stands 18" high; one belt shipping apparatus; tight and loose pulleys, $12'' \times 6''$; speed, 860 turns per minute.

HORSE POWER to drive, 3; floor space occupied, $74'' \times 76''$.



No. 199 Automobile Wheel Assembling and Boring Machine.

Export Shipping Weight, 5,100 Pounds.

Net Weight, 4,300 Pounds.

Cubic Measurement, 192 Feet.

Cable Word, AUVERGUE.

No. 199 Automobile Wheel Assembling and Boring Machine.

Export Shipping Weight, 5,100 Pounds.

Net Weight, 4,300 Pounds.

Cubic Measurement, 192 Feet.

Cable Word, AUVERGUE.

THIS ENGRAVING represents our new No. 199 Automobile Wheel Assembling and Boring Machine, designed for the use of automobile wheel builders. It receives the finished spokes and felloes, presses them firmly together, and while in this position it bores the center hole for the hub and the bolt holes for the flanges, after which the hub is attached and the wheel prepared for the finishing machines.

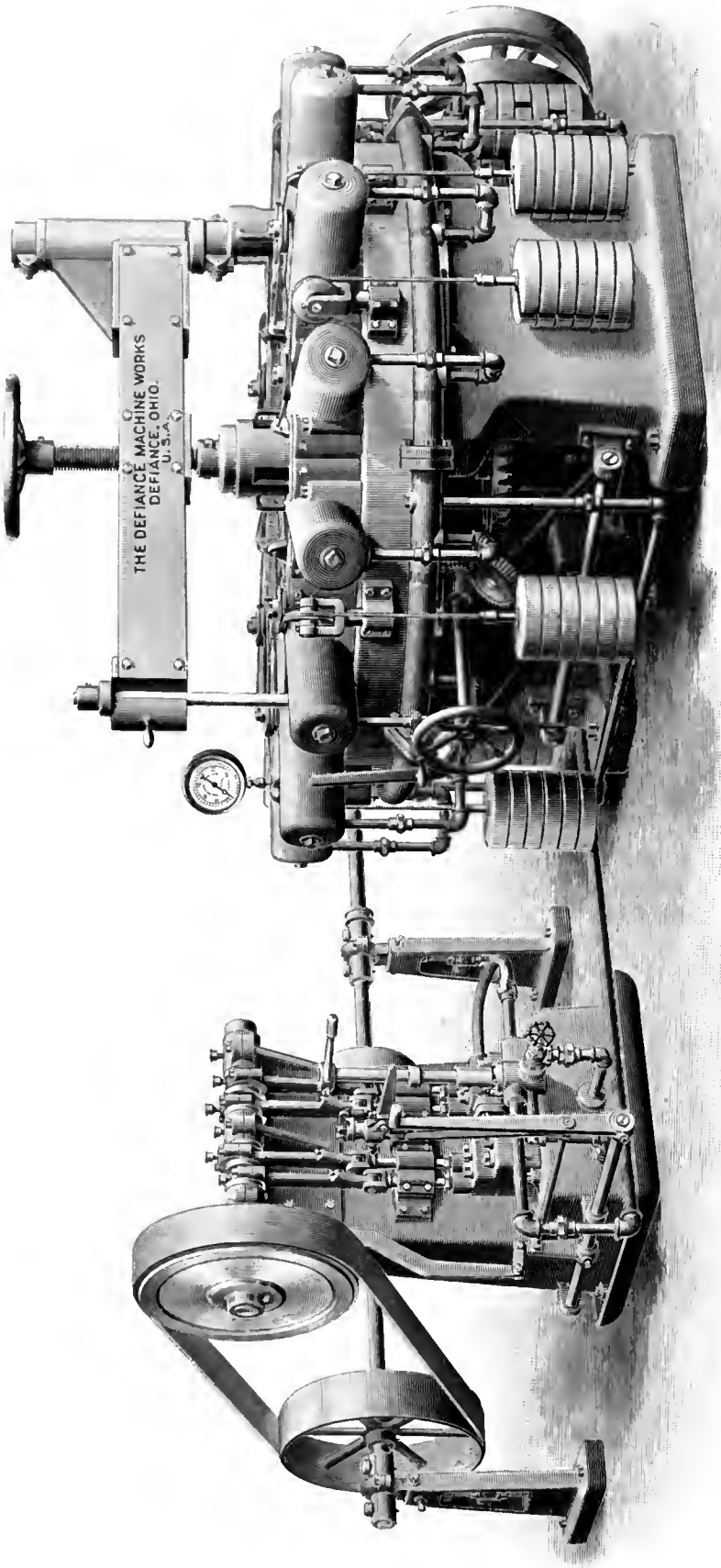
THE FRAME is a massive casting in one piece, with cored center and a broad floor base. It is of sufficient strength to do the heaviest work in this line without springing or injuring the working parts.

THE CHUCK is universal. It is powerful and positive. All the jaws are actuated simultaneously by heavy cut gears and screws, which are driven by a double friction clutch. By a convenient hand lever the frictions are moved from right to left to open or close the jaws, with a quick return motion when backing out to release the wheel, but when placed at an intermediate position the movement of the jaws is instantly arrested, the frictions acting as loose pulley, the operator having instant control over the motion of the jaws from the working side of the machine, securing and holding any pressure required on the wheels while boring and attaching the hub. The hub is placed into the machine before placing the spokes and rims into the chuck, and it rests upon the end of an upright spindle or plunger, having a vertical adjustment by the hand wheel shown. After the wheel has been assembled and bored the hub is brought up through the wheel and bolted to it.

THE BORING ARM is fitted to a large upright post, and it rests upon a ball-bearing, so that it can be easily moved to any part of the work or swung back clear of the machine, similar to a radial drill. The main spindle for boring the center hole for the hub is centered true with the wheel by a guide pin in the end of the vertical spindle that supports the hub, requiring no care on the part of the operator to bore the hole central. The spindle for drilling the bolt holes is fitted to a short radial arm attached to the larger one, and it can be instantly moved to any position required. Both spindles rotate in self-lubricating bearings, having a quick return movement from the work by means of a weighted counter-balance.

THE COUNTER: Shaft, 72″ × 1 15/16″; pulley for running the plungers in, 10″ × 4½″; pulley for running the plungers out, 16″ × 4½″; tight and loose pulleys, 12″ × 6″; speed, 860 turns per minute; one loose pulley, 8″ × 9″, with flange in center; one loose pulley, 8″ × 4½″, for independent drive for center boring attachment; speed, 860 turns per minute; two floor stands 20″ high.

HORSE POWER to drive, 5; floor space occupied, 75″ × 144″.



No. 200 Heavy Hydraulic Auto-Truck Wheel Assembling Machine.

Export Shipping Weight, 22,300 Pounds.
Net Weight, 19,460 Pounds.
Cubic Measurement, 449 Feet.
Cable Word, ASTOR.

No. 200 Heavy Hydraulic Auto-Truck Wheel Assembling Machine.

Export Shipping Weight, 22,300 Pounds.

Net Weight, 19,460 Pounds.

Cubic Measurement, 449 Feet.

Cable Word, ASTOR.

THE ENGRAVING shown on the opposite page represents our No. 200 Heavy Hydraulic Auto-Truck Wheel Assembling Machine, used by the builders of auto-truck wheels for accurately and rapidly assembling or pressing firmly together the felloes and spokes and attaching the false hub, thus preparing the wheel for our No. 204 Heavy Auto-Truck Wheel Sizing Machine. It will accommodate wheels from 22″ to 42″ in diameter, with treads up to 13″ in width.

THIS MACHINE is built extremely stiff and powerful to withstand the heavy and, at the same time, accurate work for which it is intended.

THE TABLE is a massive casting in one piece with the fourteen hydraulic cylinders and plungers securely mounted upon it, and it rests upon a heavy cast frame which supports all the working parts of the machine.

THE STOCK from which auto-truck wheels are assembled by this machine should be accurately prepared. The spokes and rims, after being properly prepared, are placed upon the adjustable table and the hydraulic rams are simultaneously brought up to the work, making a true circle at any diameter. The wheel is pressed together tightly and held in that position until the false hub is securely attached, after which the rams retreat from the work with a quick return movement.

THE HYDRAULIC POWER for this machine is obtained by the use of fourteen cylinders containing the rams, which are 5″ in diameter and fitted with an ingenious device connecting them together, making their movements simultaneous, which insures a uniform pressure. The rams will each convey a pressure of twenty tons making the combined pressure, obtainable from all the plungers, 280 tons, which is more than double the amount that will ever be required.

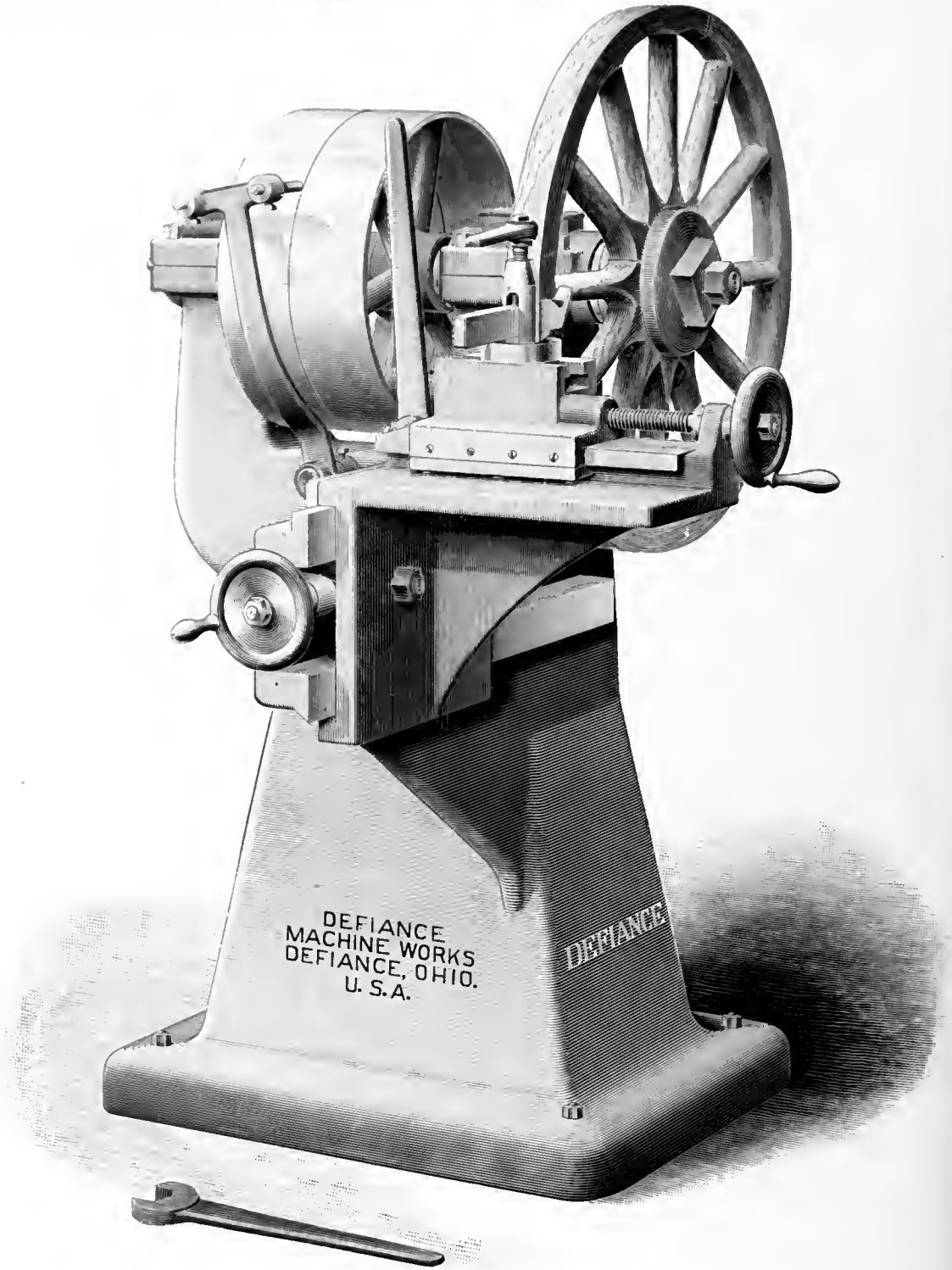
A HEAVY SCREW PRESSING DEVICE is arranged underneath the table, controlled by quick-acting frictions and operated by a convenient hand lever. This in conjunction with the heavy steel adjusting screw, supported by the swinging arm above the machine, presses the false hub firmly together until it is secured by a tapered key, the efficiency of which lies in the fact that it can be removed with one blow of a hammer.

THE PUMP is of the four cylinder type. The body or reservoir is cast in one piece and holds one barrel of oil; light engine oil giving best results. It is driven by a 6″ belt on a 24″ diameter friction pulley and is provided with the necessary dogs for latching in or out of motion. The four plungers are 1⅜″ diameter, of hammered and ground tool steel. All stuffing boxes and glands are of bronze. The crank shaft is made of one piece of special hammered steel and runs in long genuine babbitt metal bearings. The connecting rod bearings are lined with bronze. The check valves are readily accessible by simply unscrewing a bonnet, when the valve may be lifted out, and with a special socket wrench the seat may be easily removed.

THE PRESSURE GAUGE is located in a convenient position to the operator and registers the pressure on each individual plunger as well as the aggregate pressure upon the combined plungers. The safety valve may be set to any desired pressure, which may be instantly increased, as desired, and when the controlling lever is released the pressure returns to its original setting.

THE COUNTER is arranged to drive both the pump and the assembling machine: Shaft, 2⅞₁₆″ diameter × 14 feet in length; three No. 2 adjustable ball and socket floor stands; one drive pulley for pump, 26″ × 6″; two drive pulleys for assembling machine, 18″ × 5″; one pair tight and loose pulleys, 14″ × 6″; speed, 250 revolutions per minute.

HORSE POWER to drive, 10; floor space occupied, 10 feet × 14 feet.



No. 298 Automobile Wheel Sizing Machine.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 69 Feet.

Cable Word, SAULX.

No. 298 Automobile Wheel Sizing Machine.

Export Shipping Weight, 1,400 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 69 Feet.

Cable Word, SAULX.

THIS No. 298 AUTOMOBILE WHEEL SIZING MACHINE is one of a set of special tools designed to increase the capacity and improve the quality of the work over methods previously employed. By the use of this machine and a special apparatus for rapidly measuring the inside diameter of the steel tire, the wheel can be turned true to the proper diameter to suit the inner diameter of the steel tire used thereon, making allowance for shrinkage and forcing on, doing the work without the use of calipers and with unskilled labor to handle the machine.

THE WORKING PARTS are supported upon a heavy and substantial frame with a wide base. The main spindle of large diameter is hollow with the mandrel which supports the wheel extending through it, the rear end of which is conical. The front end is fitted with screw and nut and suitable metal plates between which the wheel is accurately and securely clamped. The main spindle bearings of genuine babbitt metal are self-lubricating.

THE SADDLE which supports the tool slide is accurately fitted and gibbed to the bracket with a right angular adjustment to the main spindle by a convenient hand screw to govern the diameter of the wheel to be turned. This adjustment is sufficient to accommodate wheels from the smallest sizes up to 42″.

THE TOOL POST SLIDE is carefully fitted and gibbed to the saddle to take up slack in the event of wear, and it is moved across the face of the wheel's felloe by hand wheel and screw. A diamond point tool is used which is capable of reducing the wheel to its proper diameter at a single cut.

THE TIGHT AND LOOSE PULLEYS on the machine are 16″ diameter, 4″ face, and should run 270 turns per minute. A convenient belt shipper for starting and stopping the machine is supplied, and it is fitted with an automatic brake to stop the machine instantly when the belt is moved to the loose pulley.

AN INTERMEDIATE COUNTER is furnished when necessary at an extra price as follows: Shaft, 1 15/16″ × 44″; two No. 2 ball and socket drop hangers; one driving pulley, 10″ diameter, 9″ face; tight and loose pulleys, 10″ diameter, 5″ face; speed, 440 turns per minute.

HORSE POWER to drive, 1½; floor space occupied, 50″ × 44″.

No. 68 Automobile Tire Measuring Machine.

Export Shipping Weight, 325 Pounds.

Net Weight, 185 Pounds.

Cubic Measurement, 11 Feet.

Cable Word, MOUNIER.

No. 68 Automobile Tire Measuring Machine.

Export Shipping Weight, 325 Pounds.

Net Weight, 185 Pounds.

Cubic Measurement, 11 Feet.

Cable Word, MOUNIER.

THE OBJECT OF THIS MACHINE is to secure the true inside circumference of steel tire used on automobile and other vehicle wheels, in order to determine the exact diameter to make the wheel upon which the tire is used and have them fit properly, making the necessary allowance for shrinkage and forcing on, all of which is now accomplished with great accuracy by this device without the use of calipers and by unskilled labor.

THE MEASURING DISC is laid off in inches and fractions. It is accurately fitted to the top of the pedestal in a reamed hole and supported upon a hinged joint with sufficient adjustment to cover from a 20″ to a 40″ circle. The pin projecting up through the center of the disc acts as a handle to move the disc up to and rotate it against the inner circle of the tire, which rests upon the four lugs shown. The disc is started to rotate at a given point marked on the tire, with index figure 0 agreeing, and it is then moved around the tire until the mark is reached, which indicates its exact circumference, which is then transferred to a linear scale shown at the base of the machine, which is graduated into proportional or half size inches. The scale is then slipped over the spindle on the Automobile Wheel Sizing Machine No. 298, and the turning tool adjusted against the end of the scale giving the exact diameter to which the wheel shall be turned, entirely eliminating the possibility of turning the wheel to an improper size.

FLOOR SPACE OCCUPIED, 40″ × 40″.

No. 204 Heavy Auto-Truck Wheel Sizing Machine.

Export Shipping Weight, 4,650 Pounds.
Net Weight, 3,900 Pounds.
Cubic Measurement, 126 Feet.
Cable Word, SILX.

No. 204 Heavy Auto-Truck Wheel Sizing Machine.

Export Shipping Weight, 4,650 Pounds.
Net Weight, 3,900 Pounds.
Cubic Measurement, 126 Feet.
Cable Word, SILX.

THE ENGRAVING on the opposite page illustrates our No. 204 Heavy Auto-Truck Wheel Sizing Machine, the purpose of which is to dress the tread and sides of automobile and similar wheels, and by the use of our No. 68 Automobile Tire Measuring Machine, which rapidly measures the inside diameter of the steel tire, this machine will accurately size the wheel to receive the tire intended for it, making proper allowance for shrinkage and for forcing on, and doing the work with unskilled labor and without the use of calipers.

A SUBSTANTIAL FRAME, with a wide base, supports the working parts of this machine. The main spindle, of large diameter, is hollow, with a mandrel which supports the wheel fitted to it. A separate mandrel is required for each different size of hub, and these mandrels are held in position by a tapered key and can be quickly changed. The opposite end of the mandrel is supported by a quick-acting tail-stock which is fitted with a conical-shaped bronze self-oiling bearing.

THE KNEE, which supports the rest, is cast with cored center and is gibbed to the main frame, having a horizontal adjustment with a hand-wheel and screw for work of different diameters.

THE SLIDE REST is mounted upon the knee, nicely fitted to it, and pivoted upon a heavy center stud. It can be set parallel with the spindle or at any angle for turning straight, tapering or crowning work, and with a single screw can be locked securely in any position.

THE TOOL REST is accurately scraped and fitted with a taper gib; it can be adjusted to any position with the spindle.

THE OPERATOR has complete control over the machine from the working side. The foot treadle at the base operates a friction brake which is brought to bear against the inner side of the cone pulley to stop the machine promptly.

THE COUNTER is furnished as follows: Shaft, $2\frac{3}{16}''$ × 5 feet 6″ in length; three $2\frac{3}{16}''$ slip collars; iron cone pulley, $29\frac{3}{4}''$, $26\frac{3}{16}''$, and $21\frac{15}{16}''$ × 6″ face; tight and loose pulleys, 16″ × 8″; speed, 500 revolutions per minute; cone pulley on spindle, $24\frac{1}{8}''$, $19\frac{15}{16}''$, and $15\frac{7}{8}''$ × 6″ face.

HORSE POWER to drive, 5; floor space occupied, 54″ × 84″.

No. 100 Automobile Wheel Boring and Facing Machine.

Export Shipping Weight, 4,700 Pounds.

Net Weight, 3,800 Pounds.

Cubic Measurement, 203 Feet.

Cable Word, WARWICK.

No. 100 Automobile Wheel Boring and Facing Machine.

Export Shipping Weight, 4,700 Pounds.
Net Weight, 3,800 Pounds.
Cubic Measurement, 203 Feet.
Cable Word, WARWICK.

THIS ENGRAVING represents our new No. 100 Automobile Wheel Boring and Facing Machine, especially designed to meet the rapidly increasing demand for motor car wheels. It is so constructed that the boring and facing are performed very rapidly and smooth and perfectly true with the rim of the wheel. It is one of the greatest labor saving tools that has ever been invented for the wheel shop.

THE FRAME of modern design is an exceedingly heavy casting in one piece, with a broad floor base to stand firm and to overcome all tendency to spring or chatter.

THE CHUCK is of the four jawed universal type and it is fitted to a 6″ spindle. All the dogs are actuated simultaneously by turning with a wrench any one of the four screw heads, opening and closing them to receive wheels from the smallest size up to 42″ diameter.

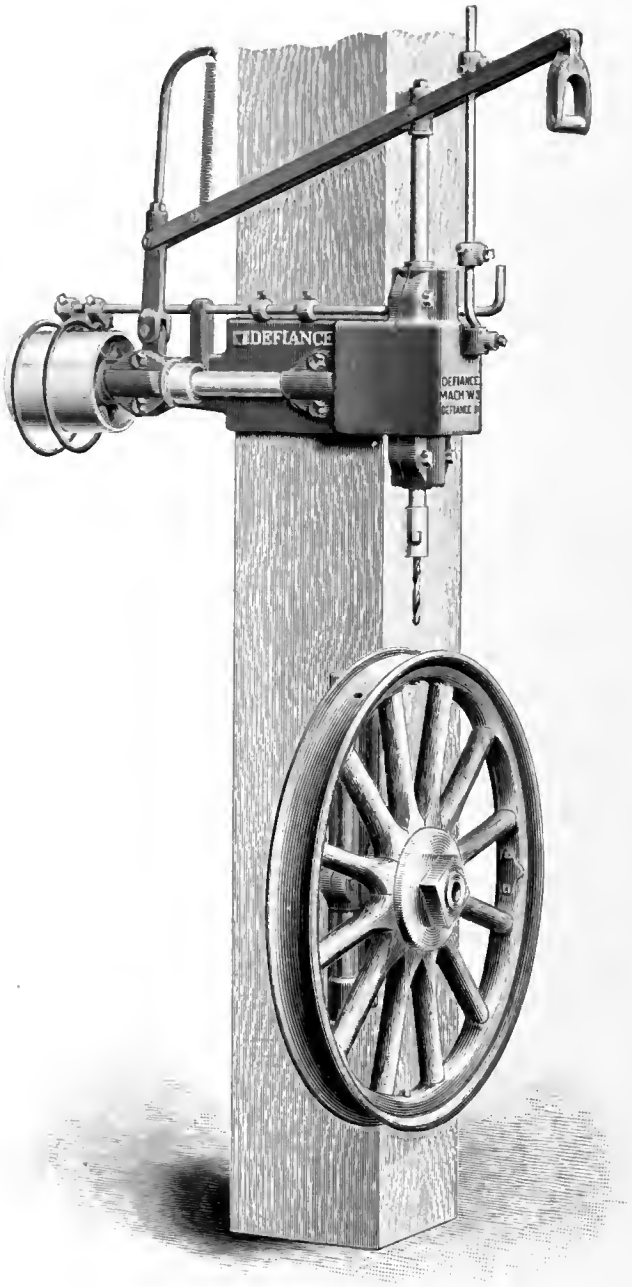
THE BORING BAR, of hammered steel of large diameter, rotates in self-lubricating bearings, and it is quickly moved to or from its work by a convenient hand wheel.

THE FACING HEAD stands at right angles with the boring bar, and it is adjustable to face the spokes parallel or to an angle in either direction. It is also brought up to its work by a hand wheel and provided with suitable stop to gauge the depth of cut and regulate the exact thickness of the spokes. It is automatically moved out of the path of the boring bar as the bar advances toward the wheel and returns to its cutting position as the bar retreats, overcoming any liability of running the cutting tools into each other.

THE OPERATOR has complete control over the machine from the working side. The chuck and all the rotating parts of the head stock can be set in motion or arrested by the use of convenient levers. It possesses every convenience of operation: it is thoroughly durable and unusually well adapted to rapid and accurate work.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}'' \times 9$ feet; three No. 2 ball and socket adjustable drop hangers; one pulley, $16'' \times 16''$ straight face, to drive boring spindle; one pulley, $20'' \times 40''$ straight face, to drive facing head; one pulley, $2^{3}/_{4}''$ diameter $\times 6^{1}/_{4}''$ straight face, and one, $12'' \times 8^{1}/_{4}''$ straight face, for driving the chuck at two speeds; the tight and loose pulleys are 14″ diameter, 6″ face, and should run 500 turns per minute.

HORSE POWER to drive, 5; floor space occupied, $46'' \times 106''$.



No. 16 Automobile Wheel Drilling Machine.

Export Shipping Weight, 300 Pounds.

Net Weight, 215 Pounds.

Cubic Measurement, 8 Feet.

Cable Word, BANDIA.

No. 16 Automobile Wheel Drilling Machine.

Export Shipping Weight, 300 Pounds.

Net Weight, 215 Pounds.

Cubic Measurement, 8 Feet.

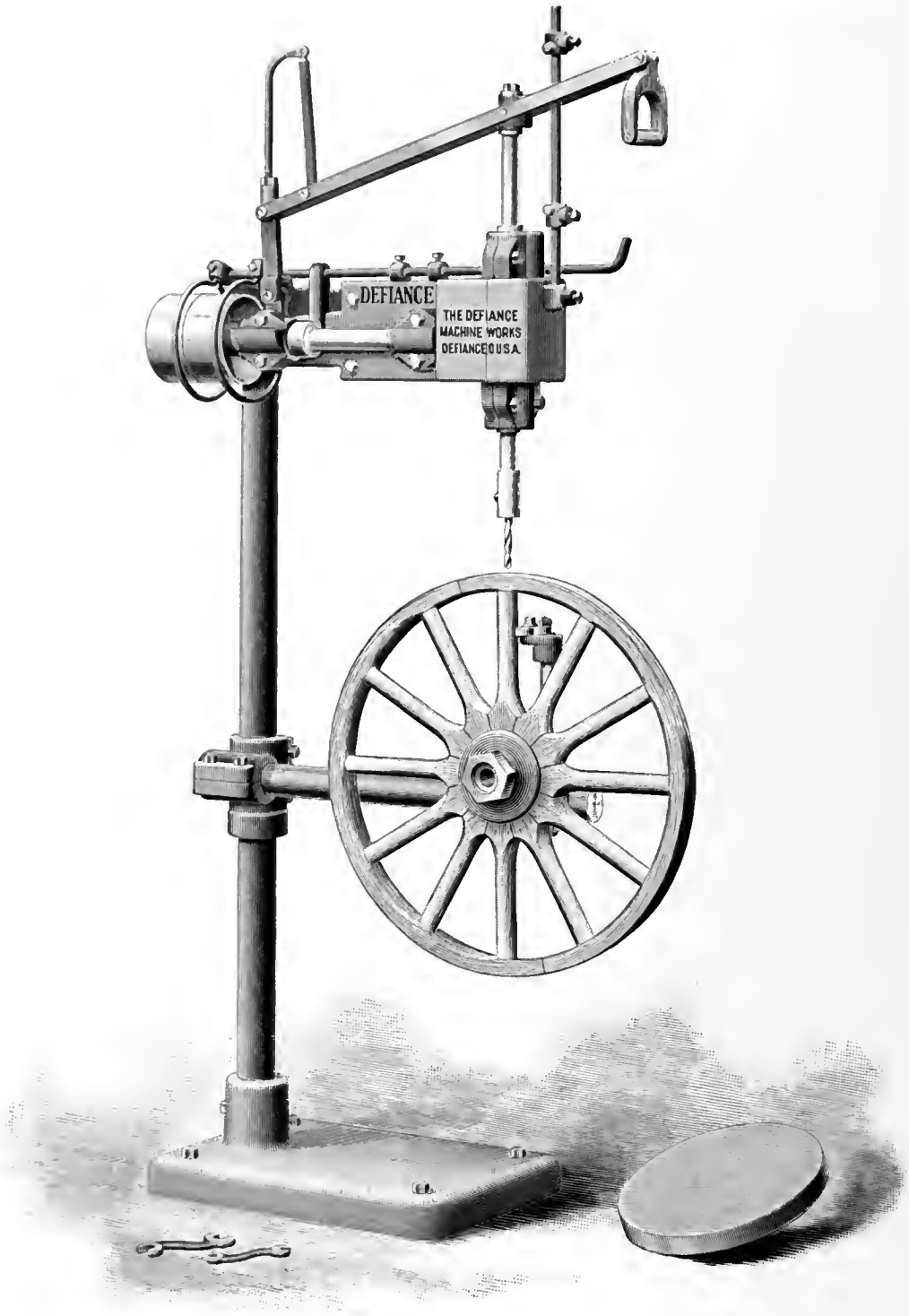
Cable Word, BANDIA.

THIS ENGRAVING represents our new No. 16 Automobile Wheel Drilling Machine, which has been designed for drilling through the metal and wood rims of automobile wheels for the bolts, clips, and valve. It is also used for concaving or relieving the ends of the spokes before the tire is pressed on. The wheel is supported upon a steel spindle, which is adjustable up and down for wheels of different sizes, and easily turned on the spindle to reach with the drill any part of the rim.

THIS MACHINE can be quickly attached to a post in any part of the workshop where it can be reached by a belt from the main line shaft. It is fitted with a ground steel boring spindle 1⅛″ diameter, which slides into a splined sleeve, which revolves in long self-lubricating bearings. The lower end is fitted with a ½″ straight hole to receive the boring bit. It is provided with a vertical movement of 8″, and it is brought down to its work by a convenient hand lever, with quick return movement by means of a coil spring. Suitable stops are provided to gauge the depth of boring, and it is driven by cut miter gearing which is thoroughly encased.

THE TIGHT AND LOOSE PULLEYS are 6″ diameter, 3″ face, with the loose pulley fitted with bronze bearings and a self-oiling device. They should run 250 turns per minute, and they can be belted to from above, below, or either side. A convenient belt shipper is attached.

HORSE POWER to drive, ½; floor space occupied, 37″×42″.



No. 17 Improved Automobile Wheel Boring Machine.

Export Shipping Weight, 600 Pounds.

Net Weight, 450 Pounds.

Cubic Measurement, 16 Feet.

Cable Word, BORERAY.

No. 17 Improved Automobile Wheel Boring Machine.

Export Shipping Weight, 600 Pounds.

Net Weight, 450 Pounds.

Cubic Measurement, 16 Feet.

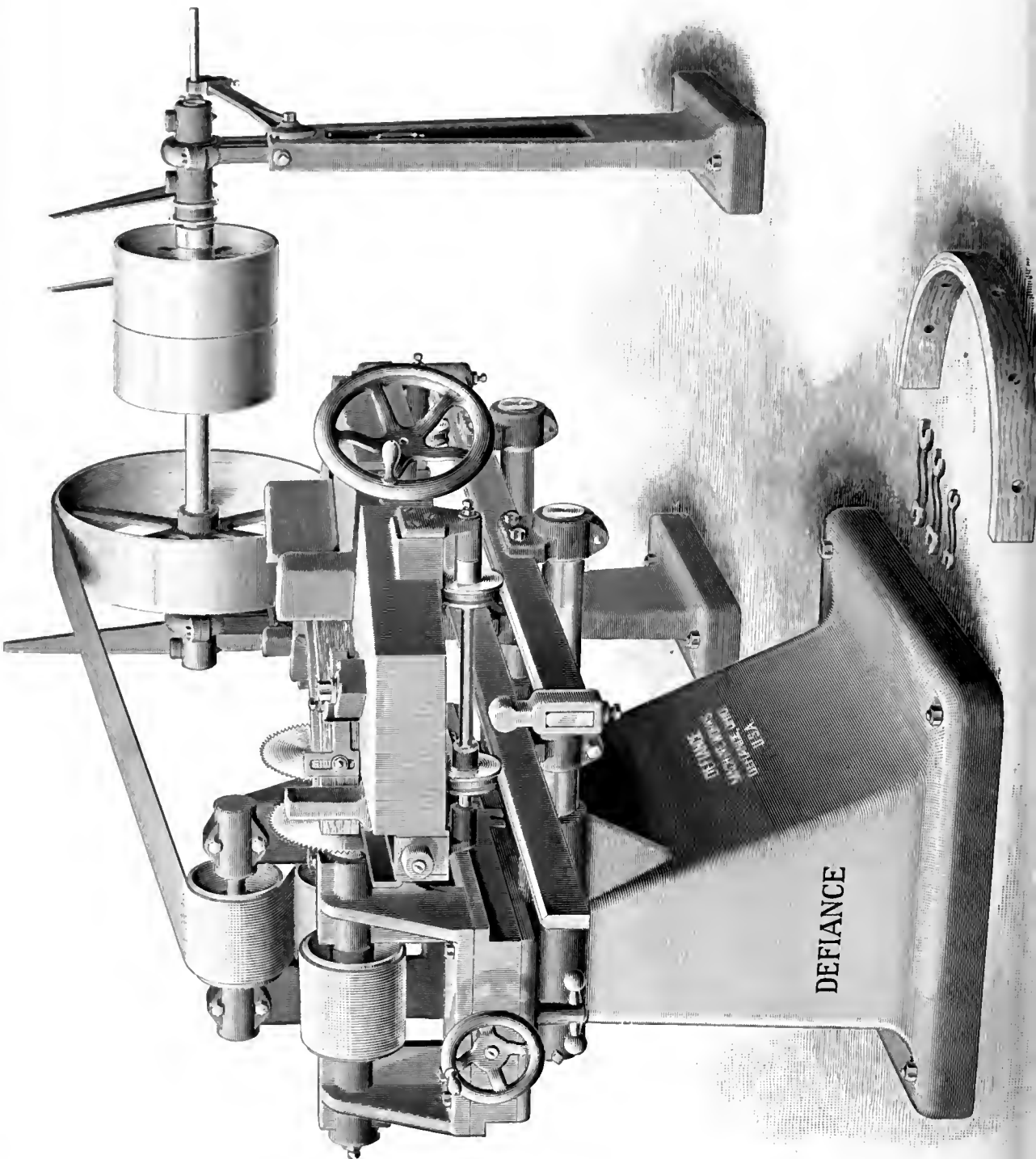
Cable Word, BORERAY.

THIS ENGRAVING represents our No. 17 Improved Automobile Wheel Boring Machine, designed for relieving the ends of the spokes and boring the bolt holes for the flanges on automobile wheels. It is entirely self-contained and extremely convenient in adjustment and operation. The wheel is supported upon a steel spindle which is adjustable to hold the wheel vertically or horizontally. It is provided with a stop gauge to accurately bring the center of the spoke true with the boring bit without any care on the part of the operator.

THE BORING SPINDLE, of ground steel 1⅛″ diameter, slides through a splined sleeve which rotates in long self-lubricating bearings. The boring end is provided with a ½″ straight hole to receive the boring bit. It has a vertical movement of 8″, and it is brought down to its work by a convenient hand lever with a quick return movement by the aid of a coiled spring. Suitable stops are provided to regulate the amount of movement required. It is driven by cut miter gears thoroughly encased. A round iron table, 10″ in diameter, is provided for plain boring, and it can be quickly attached to the spindle which supports the wheel.

THE TIGHT AND LOOSE PULLEYS are 6″ diameter, 3″ face, and they should run 2,000 turns per minute and can be belted to from above or below.

HORSE POWER to drive, 1; floor space occupied, 24″×36″.


DEFIANCE

No. 88 Automobile Wheel Rim Equalizing and Truing Machine.

Export Shipping Weight, 2,600 Pounds.

Net Weight, 2,100 Pounds.

Cubic Measurement, 80 Feet.

Cable Word, RHENEA.

THIS ENGRAVING represents our new No. 88 Automobile Wheel Rim Equalizing and Truing Machine, especially designed for cutting off the ends of rims or felloes and reducing the same to a true semi-circle, eliminating the necessity of sawing the joints when putting the rims on the wheel. The rims are held true in a powerful universal chuck. Two saws are employed, one for each end of the rim, requiring but a slight movement of the carriage from right to left to finish the work. Two rims of ordinary widths can be placed into the chuck at one time.

THE FRAME is a heavy trunk casting in one piece with cored center and a broad floor base with the saw arbor frames gibbed to the top, having a horizontal adjustment by hand wheel and screw to or from each other to accommodate rims of various diameters. Provision is made in making the adjustment to care for proper tension of the drive belt on the pulleys without any care on the part of the operator.

THE SAW ARBORS AND SPINDLES, of ground steel, large in diameter, rotate in long self-oiling bearings, and they are fitted with screws at the outer end of the boxes to take up end play.

THE CARRIAGE supporting the chuck travels upon V-shaped steel tracks which are planed perfectly true. The axles of the carriage rotate in roller bearings, making the movement of the carriage to and from the saws extremely light and easy, requiring no effort on the part of the operator to move it.

THE RIMS are first bored before going into the chuck, and they are centered in the chuck by an index pin in one of the spoke holes in the rims. By this method they are held in the same relative position as the spokes in the wheel on which they are used, always bringing the joints of the rims in proper position with the wheel.

THE COUNTER is furnished as follows: Shaft, $1^{15}/_{16}'' \times 48''$; two floor stands 44" high to center; one driver, $24'' \times 6''$; tight and loose pulleys, $14'' \times 6''$; speed, 750 turns per minute.

HORSE POWER to drive, 5; floor space occupied, $54'' \times 120''$.

No. 4 Patent 60-Ton Hydraulic Automobile Tire Press.

Export Shipping Weight, 5,700 Pounds.

Net Weight, 4,900 Pounds.

Cubic Measurement, 180 Feet.

Cable Word, PENNINE.

No. 4 Patent 60-Ton Hydraulic Automobile Tire Press.

Export Shipping Weight, 5,700 Pounds.
Net Weight, 4,900 Pounds.
Cubic Measurement, 180 Feet.
Cable Word, PENNINE.

THIS ENGRAVING represents our new No. 4 Patent 60-Ton Hydraulic Automobile Tire Press, which has been designed for the use of motor wheel builders for pressing the steel tire on to the wheel. Rings of the proper thickness are used on both sides of the wheel's felloe when placed into the machine to insure the pressing of the tire on to the wheel to the exact position required, and true with the felloe without injury to the tire or wheel, and requiring no skill on the part of the operator to successfully accomplish the work.

THE FRAME is massive and heavy to overcome all tendency to spring and to accommodate the heaviest work now required of this class of machinery, and secure a positive and steady pressure to insure accuracy and a large capacity.

IT WILL accommodate wheels up to 45″ diameter and smaller, and the greatest distance between the flanges when wide open is 15″. The upper flange is fitted to a heavy steel screw with quick adjustment up or down for narrow or wide tire.

THE PUMP is of the double type of the most improved kind. It is very substantial and will not get out of order and produces a steady movement to the ram. It is located within the liquid reservoir attached to the base of the main frame close to the cylinder, thus securing immediate action to the ram in starting the pump, and it is thoroughly covered to exclude dust or dirt.

THE HYDRAULIC CYLINDER is a part of the lower crossbeam and the liquid is delivered to it through hydraulic tubing. The relief pipe is extra large to secure a quick return movement to the ram.

THE SAFETY VALVE can be set to blow off at any desired pressure, acting as a safeguard and instantly relieving the pressure from the ram should the pressure at any time exceed the amount required.

THE PRESSURE GAUGE is inclosed within a highly finished brass case, and it designates the exact amount of pressure applied to the ram in tons and per square inch.

THE LIQUID used in the cylinder should be free from grit or other foreign substances. Light engine oil is preferred, although crude petroleum or other oils of this nature will answer.

THE FRICTION CLUTCH for driving the pump is located on the top of the main frame out of the way, and it can be instantly engaged or disengaged, the operator having complete control over the machine from the working side to regulate the pressure from 0 to 60 tons. The diameter of the friction pulley is 24″ with 4″ face, and it should run 300 turns per minute. It can be belted to from above, below, or either side.

HORSE POWER to drive, 4; floor space occupied, 44″×72″.

No. 5 Patent 60-Ton Hydraulic Automobile Tire Press.

Export Shipping Weight, 5,900 Pounds.

Net Weight, 5,100 Pounds.

Cubic Measurement, 180 Feet.

Cable Word, PYRENEES.

No. 5 Patent 60-Ton Hydraulic Automobile Tire Press.

Export Shipping Weight, 5,900 Pounds.
Net Weight, 5,100 Pounds.
Cubic Measurement, 180 Feet.
Cable Word, PYRENEES.

THIS ENGRAVING represents our new No. 5 Patent 60-Ton Hydraulic Automobile Tire Press, especially designed for pressing the steel tire on automobile and truck wheels. It will accommodate wheels up to 45″ diameter and smaller, and take between the plates when wide open 24½″. The upper plate is fitted to a heavy steel screw with quick adjustment up or down for narrow or wide work. Two metal rings of the proper thickness are used, one on each side of the wheel's felloe as a gauge for pressing the tire on to the wheel to exact position, without any care on the part of the operator except to start and stop the machine.

THE FRAME is massive and heavy, designed to overcome all tendency to spring and to handle the heaviest work with ease.

THE PUMP is of the double type of the most improved construction, strong and durable. It will not get out of order and it furnishes a positive and steady pressure to the ram. It is located within the liquid reservoir, insuring perfect lubrication of all its parts, being located close to the cylinder. Immediate action to the ram is secured in starting the pump.

THE HYDRAULIC RAM is placed within the lower crossbeam and the liquid is delivered to it through hydraulic tubing. The relief pipe is extra large to insure a quick return movement to the ram.

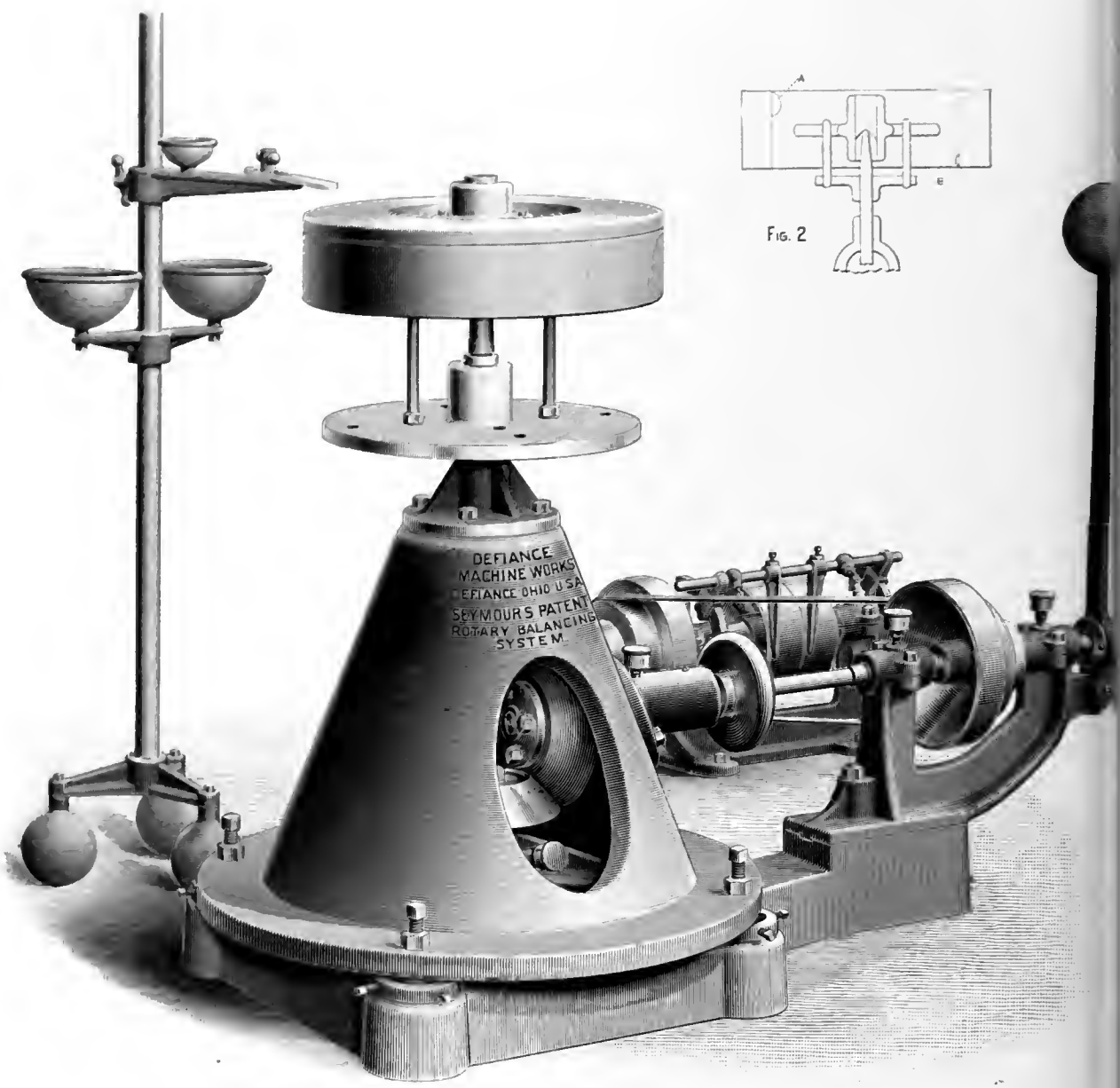
THE SAFETY VALVE can be adjusted to blow off at any desired pressure, instantly relieving the pressure from the ram should the pressure at any time exceed the amount required.

THE PRESSURE GAUGE, inclosed within a highly finished brass case, indicates the exact amount of pressure applied to the ram in tons and per square inch.

THE LIQUID used in the cylinder should be free from grit and other foreign substances. Light engine oil is preferred, although crude petroleum or other oils of this nature will answer.

THE FRICTION CLUTCH for driving the pump is located on the top of the main frame out of the way. It can be instantly engaged or disengaged, the operator having instant control over the machine from the working side. The friction pulley is 24″ diameter, 4″ face, and it should run 300 turns per minute. It can be belted to from above, below, or either side.

HORSE POWER to drive, 4; floor space occupied, 44″ × 72″.



No. 66 Patent Motor Fly Wheel Balancing Machine.

Export Shipping Weight, 1,600 Pounds.

Net Weight, 1,100 Pounds.

Cubic Measurement, 43 Feet.

Cable Word, BERNINA.

No. 66 Patent Motor Fly Wheel Balancing Machine.

Export Shipping Weight, 1,600 Pounds.
Net Weight, 1,100 Pounds.
Cubic Measurement, 43 Feet.
Cable Word, BERNINA.

THE ACCOMPANYING ENGRAVING represents our No. 66 Patent Motor Fly Wheel Balancing Machine, especially designed for the purpose of securing a running balance to motor fly wheels and other similar rotating parts of machinery not to exceed 1,000 pounds in weight.

THE FRAME is conical in form, in the center of which is placed a vertical ground steel spindle standing in a step bearing in the base of the frame, and passing up through a long bearing at the top of the frame. This spindle at its upper end carries a face plate provided with two driving pins, which project upward parallel to the axis of the spindle. A steel center with taper shank is fitted into the vertical spindle. Its upper end is reduced to a conical point and upon this rests the object to be balanced.

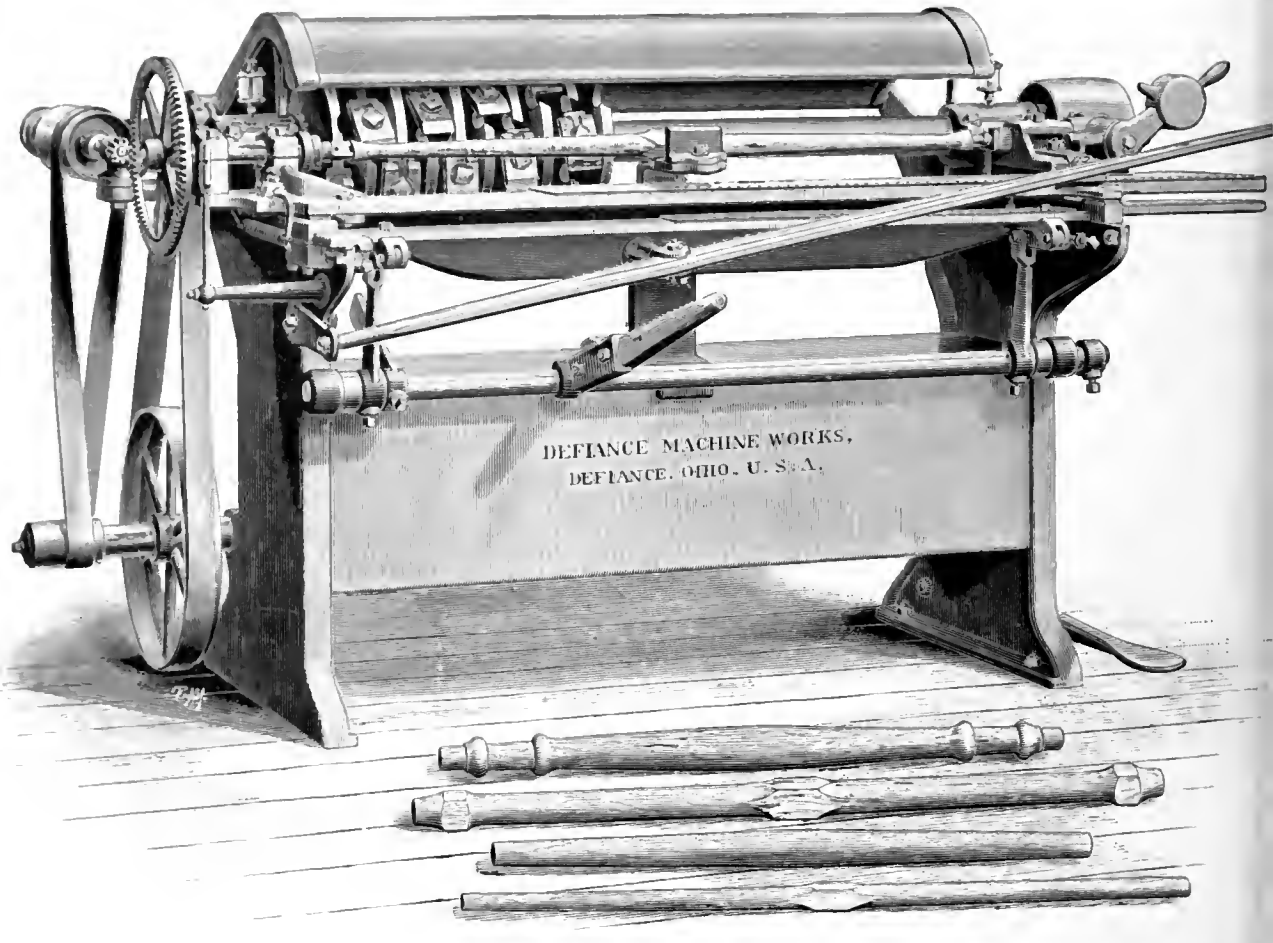
THE VERTICAL SPINDLE is rotated by friction gearing driven by a horizontal shaft in suitable bearings at the base of the machine. This horizontal shaft is in two pieces, and they are connected by a friction clutch and moved longitudinally by a counter-weighted lever so arranged that the weight may be used to press the clutches together when it is desired to rotate the object to be balanced, and to disconnect the clutches when it is desired to examine, test, and mark the object while running alone, as the driving pins are liable when pressing against the object to be balanced to produce uneven rotation. The true unbalanced condition is best shown when the disturbing influences of the motive power are withdrawn when the clutch is released.

FIGURE 2 represents a six-armed fly wheel poised and driven as described. Before rotating, locate near the center of the interior of the rim a weight of the size necessary to produce a standing balance, then rotate and mark upon the edge of the rim with a pencil of moistened clay. If the mark occur within one-fourth of the circumference of the wheel from the weight, in the direction of rotation, raise the weight and at the same time advance it toward the mark. If the mark occur at more than one-fourth the circumference from the weight, depress the weight and retreat from the mark. If, by these steps, the edge of the wheel be reached and the wheel still runs out, increase the weight and place a counter-weight diametrically and transversely opposite, so that the relative position of the two weights will be as are those of "A" and "B." Care must be taken, at every adjustment of the weights, that a standing balance be not violated. If, upon the readjustment of the first weight, the mark occur at one-fourth of the circumference of the wheel from the weight, nothing more can be done with such weight, but an additional weight must be placed at the mark, and, if this second weight disturbs the standing balance, locate a counter-weight, as in the first described condition.

In a case in which it is not permissible to attach weights, but in which excess of material must be cut away, it is obvious that an inversion of the above reasoning must often be pursued, and frequently the use of trial weights facilitates the solution.

THE TIGHT AND LOOSE PULLEYS are 7″×2½″ and should run 725 turns per minute.

HORSE POWER to drive, 2½; floor space occupied, 36″×60″.



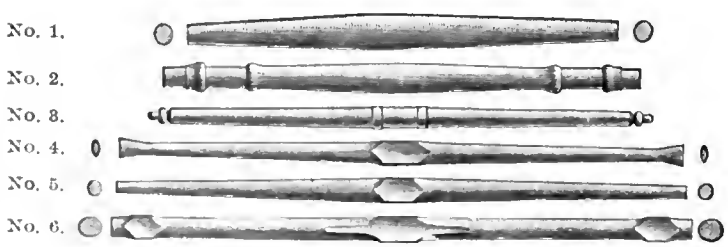
No. 1 Patent 48″ Neck-Yoke and Single-Tree Turning Lathe.

Export Shipping Weight, 3,400 Pounds.

Net Weight, 2,800 Pounds.

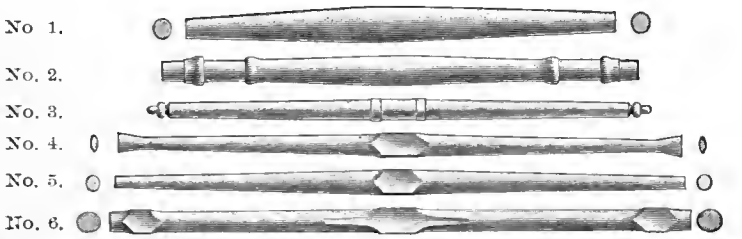
Cubic Measurement, 105 Feet.

Cable Word, LIVERY.



No. 1 Patent 48″ Neck-Yoke and Single-Tree Turning Lathe.

Export Shipping Weight, 3,400 Pounds.
Net Weight, 2,800 Pounds.
Cubic Measurement, 105 Feet.
Cable Word, LIVERY.



THIS MACHINE, as shown by the engraving, is used for turning the finest class of wagon and carriage neck-yokes, round and oval single-trees, round and flat whiffle-trees and double-trees, in all their shapes and sizes up to 5″ diameter and 48″ long at the largest, performing the work at an immense saving over any other method.

IT IS the greatest labor saving machine ever invented and is indispensable to manufacturers requiring a large amount of duplicate turned pieces. Since this machine has been invented it has almost entirely superseded every other form of machine for making neck-yokes, single-trees, whiffle-trees, and double-trees, accomplishing the turning of round, oval, and irregular shapes with equal success.

SO SIMPLE is the operation of this machine that it can be handled by inexpensive labor and perform the highest class of turning, completing neck-yokes with beaded ends and places for ferrules, making each to exact size and shape, more uniform than by a skilled hand turner.

THE FRAME is cast in one piece, very stiff and reliable.

THE SPINDLE supporting the cutter heads, of hammered steel, is $2\frac{15}{16}$″ diameter, running in genuine babbitt metal ring oiling bearings.

THE CUTTER HEADS each contain three flat shear cutting knives. For beaded turning, they are shaped to suit the style of work desired.

A SHIELD, hinged to the back of the frame, surrounds the heads, preventing any possible chance for the operator to become injured, and discharges the shavings to the back portion of the machine.

THE TABLE is constructed in two parts; the lower half is gibbed to and slides upon the frame in angular ways, and they are operated to and from the cutters by either hand or foot lever. The upper table supporting the centers is pivoted to the lower half, near the tail center end, upon which it vibrates for oval turning. At the opposite end a cast iron cam or form, of whatever shape desired to turn, is placed upon the end of live center spindle, which runs against an upright shoe attached to the lower table. As the cam revolves against the shoe, the upper table vibrates, following the path of the cam, and produces the turning of the material between the centers to correspond with shape of cam. Round work, such as neck-yokes, are finished without the use of a cam, with the vibrating table locked to the lower half, using it as a solid table.

THE FEED, which revolves the material to be turned, is started and stopped automatically, and is controlled by the movement of the table, starting when the material to be turned advances to the cylinder and stopping when moved back for the removal of the turned object.

THE TAIL CENTER is adjusted horizontally over the face of the table for short or long turning or at right angles with the head center for turning parallel or to any taper.

THE MATERIAL to be turned is placed between the centers in its rough state, either rived or sawed; requires no hewing or other preparing; taken just as it comes, is reduced to proper size and shape. Graduating screws underneath the table regulate the diameter of turning. The cam governs the shape, and the right angular adjustment of the tail center regulates the taper or diameter of turning at the ends.

THE CAPACITY depends somewhat upon the style of turning, varying from 1,500 to 2,500 pieces per day.

THE COUNTERSHAFT is 48″ × $2\frac{3}{16}$″; tight and loose pulleys, 14″ × 6″; driver, 30″ × 6″; two No. 2 hangers; belt shipping apparatus; speed of countershaft, 600 rotations per minute; pulley on cutter head spindle, 8″ × 6″; speed, 2,250 rotations per minute.

HORSE POWER to drive, 6; floor space occupied, 48″ × 72″.

No. 3 Single-Tree Dressing and Pointing Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 44 Feet.

Cable Word, SWEETER.

No. 3 Single-Tree Dressing and Pointing Machine.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 44 Feet.

Cable Word, SWEETER.

THIS ENGRAVING represents a new and useful machine, especially designed for dressing or rounding the center of single-trees and double-trees, and pointing and finishing the ends of flat-tailed whiffle-trees, doing that portion of the work which cannot be accomplished by the Automatic Single-tree Turning Lathe. Previous to the invention of this machine, this class of work was performed by hand labor, which was slow and expensive. By this new method 3,000 pieces can be successfully finished in ten hours.

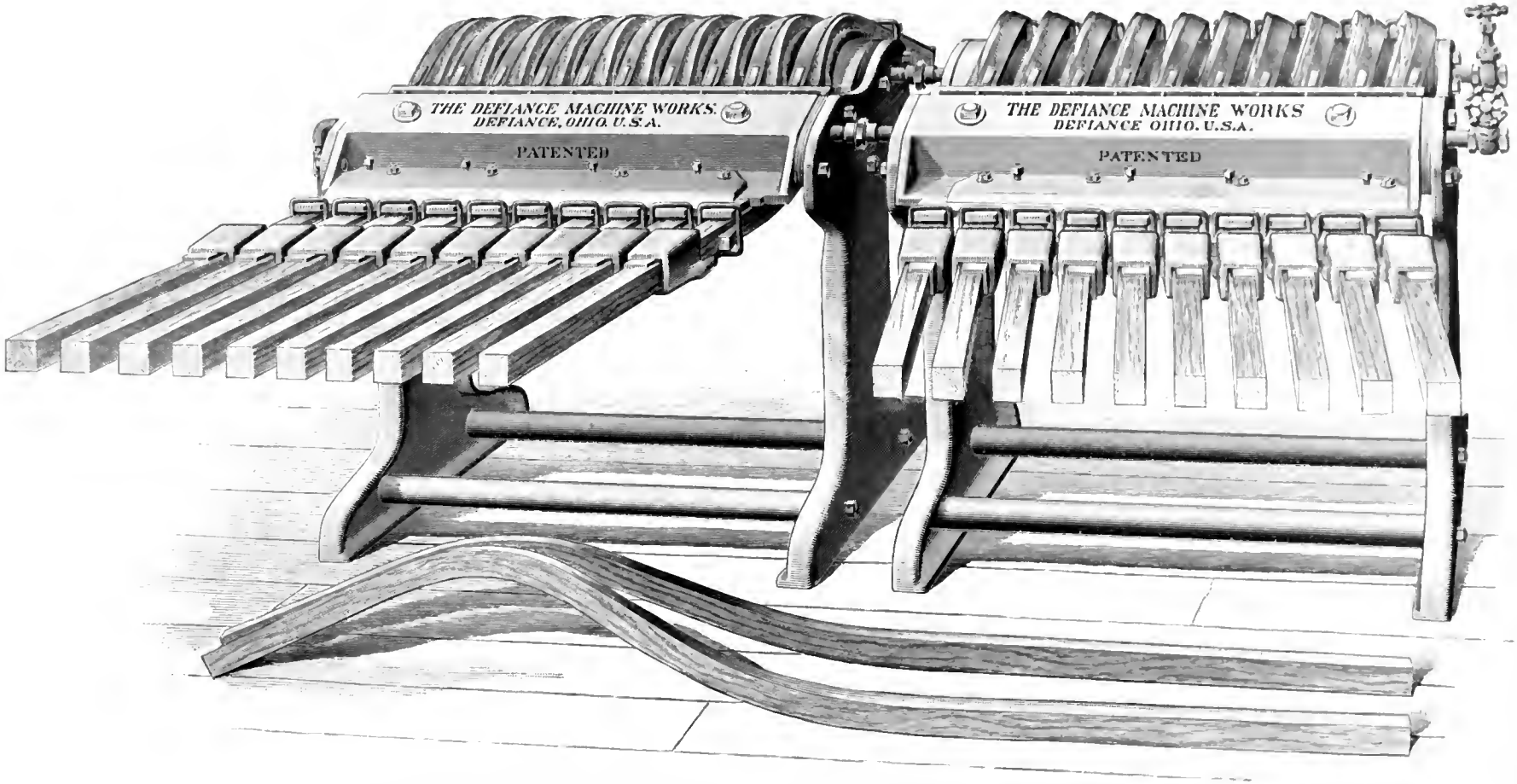
THE FRAME is a neat and substantial casting, in one piece, with cored center and a broad floor base, with a heavy steel arbor running in genuine babbitt metal boxes mounted upon it. One end of the arbor is provided with a driving pulley, the other end with a 6″ triangular cutter head, carrying three knives with chip breakers.

THE TABLES are of special construction and provided with vertical adjustments to regulate the depth of cut. They are planed true and accurately fitted.

THE WORK TO BE OPERATED UPON is placed upon the table, as shown by the engraving, horizontally with the cutters, with the flat surface of the work resting against the sliding gauge. The operator then turns the material one-half turn over the cutters, sliding the gauge with his body toward the knives, which carries the material over the cutter head to remove the corners in the center of single-trees and double-trees, rounding them on one side to the circle of the turned portion of the material and finishing it complete. The upright post, as shown, forms a gauge used to support one end of the flat-tailed whiffle-trees, while the other end is being dressed to the required taper.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}'' \times 36''$; two No. 1 ball and socket adjustable drop hangers; driving pulley, $20'' \times 4''$; tight and loose pulleys, $10'' \times 4''$; speed, 760 rotations per minute; pulley on cutter head spindle, $4'' \times 4''$; speed, 3,800 turns per minute.

HORSE POWER to drive, 2; floor space occupied, $26'' \times 60''$.



No. 1 Patent Hot-Form French Cart Shaft Bender.

Export Shipping Weight, 3,700 Pounds.
Net Weight, 2,600 Pounds.
Cubic Measurement, 158 Feet.
Cable Word, BASKET.

No. 1 Patent Hot-Form French Cart Shaft Bender.

Export Shipping Weight, 3,700 Pounds.
Net Weight, 2,600 Pounds.
Cubic Measurement, 158 Feet.
Cable Word, BASKET.

THIS ENGRAVING represents our No. 1 Patent Hot-Form Bending Machine, which has been designed especially for bending French cart shafts. It is capable of successfully bending 50 pairs of shafts in ten hours, and performing the work perfectly without breaking or fracturing the stock.

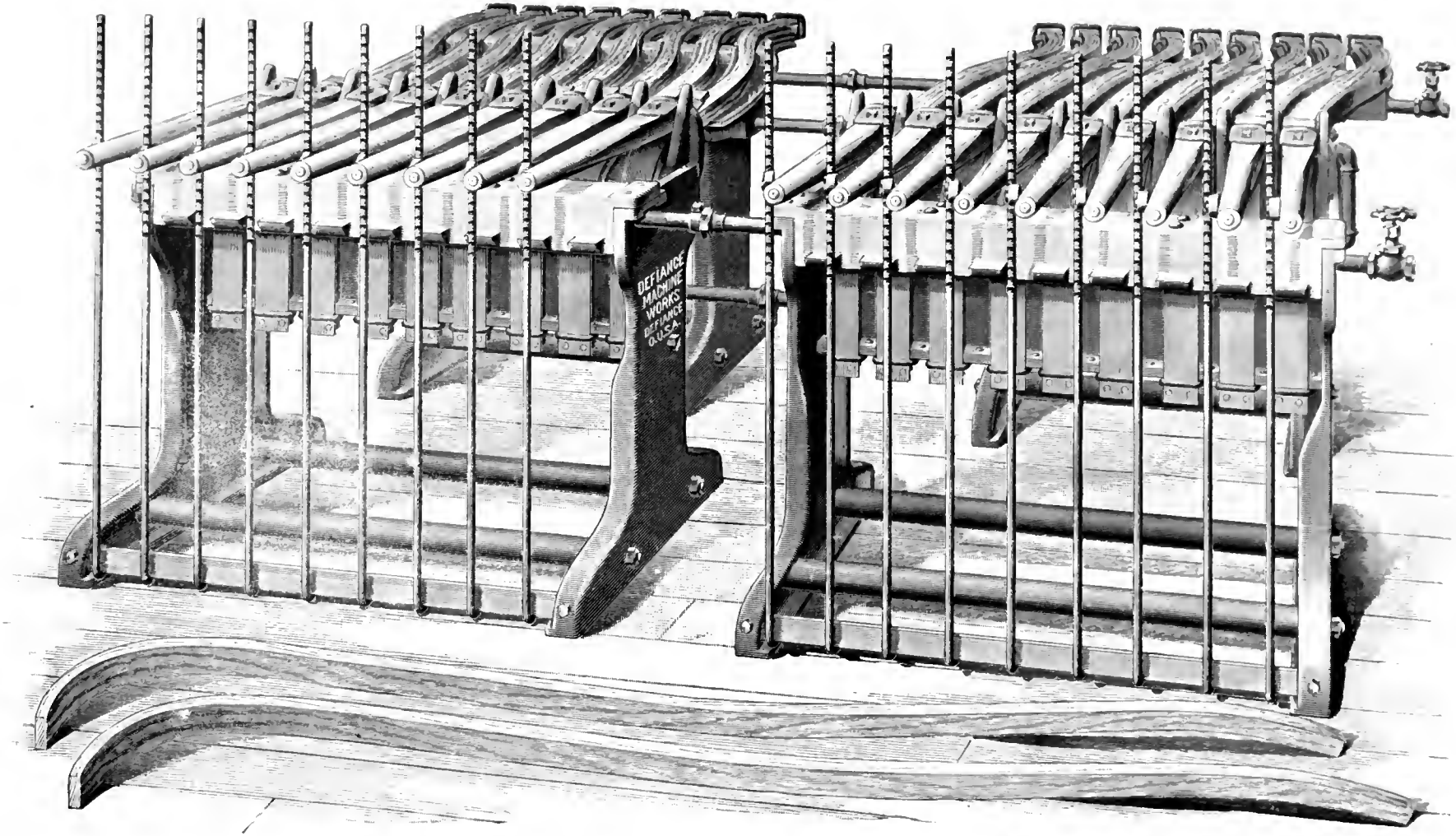
IT IS massive and heavy, the frame of the machine being made with heavy plate sides with internal ribs; the forms over which the material is bent are cored out, making a tight steam cylinder to each form, and the several steam compartments are connected together with suitable pipe and valves through which the steam circulates from one form to the other for the purpose of heating and seasoning the timber after the process of bending.

WHEN IN USE the forms are thoroughly heated either with live or exhaust steam. The material to be bent is first steamed and made as soft as possible, after which it is placed into the bending machine with the portions to be bent covered with a steel strap to prevent fracturing the material; it is then bent over the forms by the aid of convenient hand levers furnished for that purpose. Each stick bent is shackled to the forms as shown by the engraving, and allowed to remain in that position about two hours, when they are removed and the forms refilled as before. The bent sticks after leaving this machine require no fastening to hold the bend, and they will retain their proper shapes in any climate.

THIS MACHINE will bend material up to 3″ × 3″ and sizes smaller in various lengths. The lower forms can be adjusted horizontally with the upper ones for the purpose of increasing or diminishing the amount of swell on the point end of the shafts.

THE BENDING of French cart shafts previous to the invention of this new machine was an extremely difficult task, and was a very expensive operation on account of breaking and buckling the stock, and in most cases the work would straighten out or change its shape after being bent. All this is now prevented by the use of this new system, and uniform and perfect work secured at a small cost by unskilled labor.

FLOOR SPACE occupied, 120″ × 120″.



No. 2 Patent Hot-Form Shaft and Pole Bending Machine.

Export Shipping Weight, 5,600 Pounds.
Net Weight, 4,300 Pounds.
Cubic Measurement, 187 Feet.
Cable Word, BAY.

No. 2 Patent Hot-Form Shaft and Pole Bending Machine.

Export Shipping Weight, 5,600 Pounds.
Net Weight, 4,300 Pounds.
Cubic Measurement, 187 Feet.
Cable Word, BAY.

THIS ENGRAVING represents our No. 2 Patent Hot-Form Shaft and Pole Bending Machine, which is used by the manufacturers of bent woodwork for bending carriage and express shafts and poles. It is calculated to produce a single or double bend to the heel end of shafts and poles, and bend the body of shafts at the same time.

THE PRINCIPLE involved is the bending of the material over iron forms which are heated with steam to dry and season the stock after the process of bending; material so bent will retain its proper shape in any climate, which cannot be truthfully said of any other machine for shaft and pole bending.

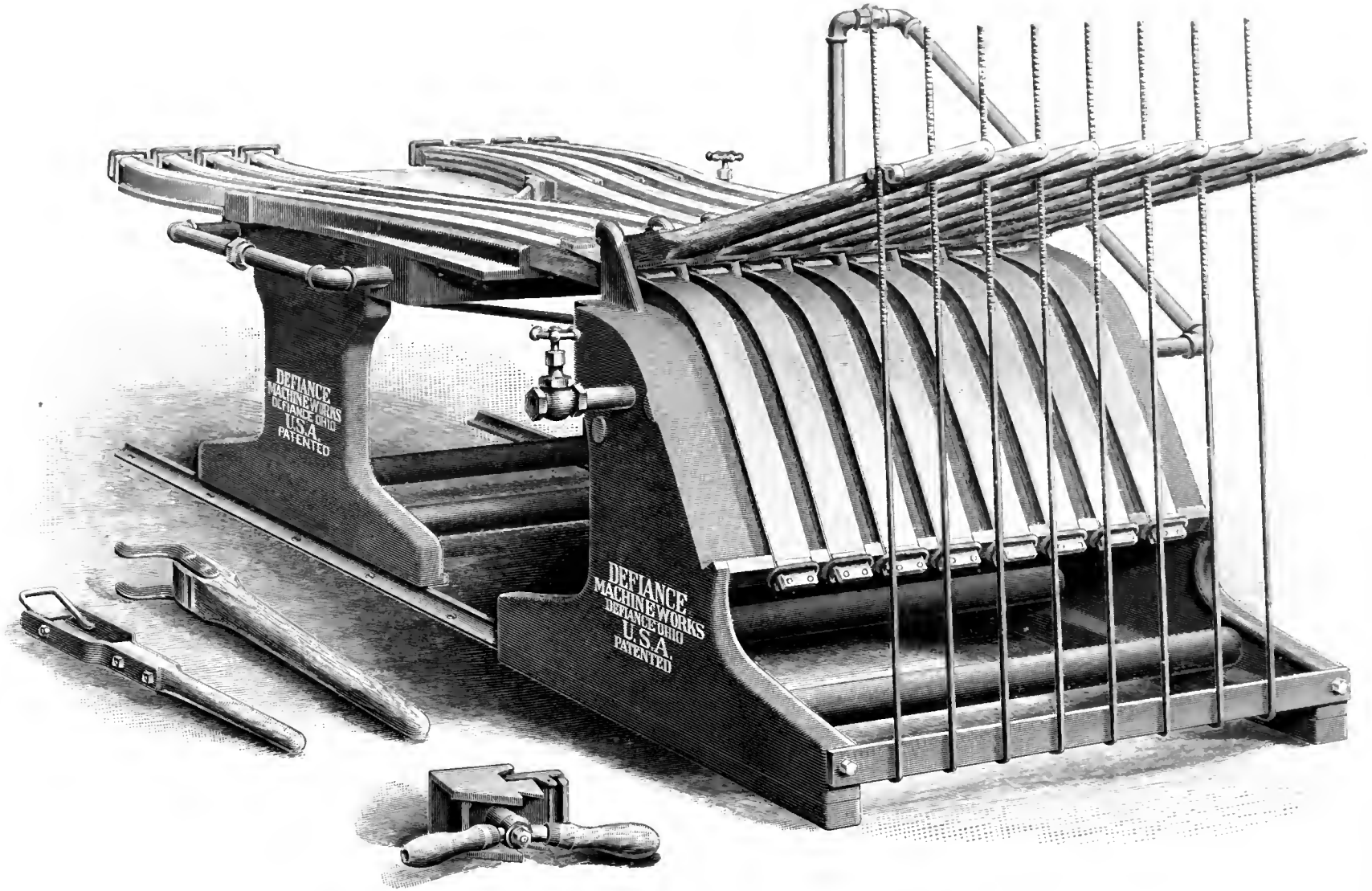
ITS CAPACITY is sufficient to bend 45 pairs of shafts, or 90 poles, in ten hours, and produce accurate work without buckling or breaking the stock.

THE FORMS are supported by heavy iron frames, which are provided with a broad floor base, with a cored chamber to each form for the reception of the steam, which is conducted through iron piping from one form to the other, with suitable valves for regulating the steam supply; the frames are adjustable to or from each other for short or long work; ribs are cast on each of the forms at the points of bending to guide the material to its proper place as it is bent over the forms; the guides used to form the tip bend on shafts are adjustable for the purpose of varying the shape of the bend at the tip end.

IN OPERATING, the material to be bent is first steamed and made as soft as possible by the usual method, after which it is placed into the bending machine with the portions to be bent covered with a steel strap to prevent fracturing; it is then bent down over the forms by suitable hand levers furnished for that purpose and locked to the forms, in which position it should remain under heat for several hours, until thoroughly dried, after which the forms are allowed to cool, when the bent stock can be removed and the machine refilled.

THE QUALITY OF WORK produced by this machine cannot be equaled by any other process, and the operation is so simple that it can be handled successfully by unskilled labor; well bent wood stock commands a good price, and is more convenient to pack for shipment than irregular bent stock made by the old way.

Floor space occupied, 120″ × 120″.



No. 3 Patent Hot Form Shaft and Pole Bending Machine.

Export Shipping Weight, 2,900 Pounds.
Net Weight, 1,900 Pounds.
Cubic Measurement, 100 Feet.
Cable Word, BELMONT.

No. 3 Patent Hot Form Shaft and Pole Bending Machine.

Export Shipping Weight, 2,900 Pounds.

Net Weight, 1,900 Pounds.

Cubic Measurement, 100 Feet.

Cable Word, BELMONT.

THIS ENGRAVING represents our No. 3 Patent Hot Form Shaft and Pole Bending Machine, which is used by the makers of bent woodwork for bending carriage and express shafts and poles. It has been designed for a smaller capacity than our Nos. 1 and 2 Machines to meet the requirements of carriage makers who desire to bend their own work.

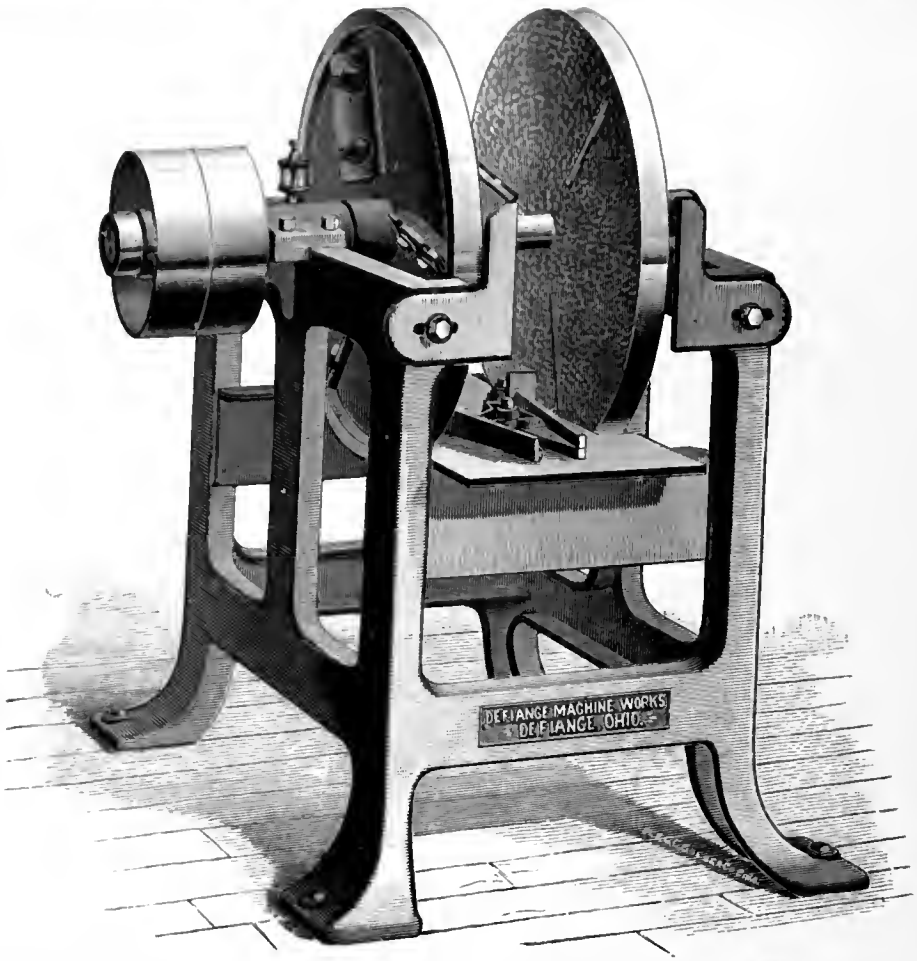
THE MATERIAL is bent over iron forms which are made to the shape of the work to be bent, and they are heated by steam to season or dry the material during the process of bending.

IT WILL bend 8 pieces at one time or 40 pieces in ten hours. The bent material should remain on the hot forms about two hours after bending to properly set, after which they will not change in shape.

THE BENDING FORMS are cast hollow for the reception of the steam, and they are supported upon heavy iron frames with a wide floor base. The one which supports the body of the shaft or pole is fitted with rollers at the base, and they travel upon a steel track to adjust it to or from the heel form for work of different lengths.

THE WORK to be bent is first steamed or soaked in hot water to make it as soft as possible, after which it is placed in the bending machine, with the portion to be bent covered with a steel strap to prevent fracturing. It is then bent down over the forms by convenient hand levers furnished for that purpose, which are then locked down tight to the forms.

FLOOR SPACE occupied, $60'' \times 120''$.



30″ Improved Shaft and Pole Heel Tapering Machine.

Export Shipping Weight, 1,350 Pounds.
Net Weight, 950 Pounds.
Cubic Measurement, 58 Feet.
Cable Word, HOPE.

THIS IMPROVED MACHINE for tapering and finishing the heel or bent end of vehicle shafts and poles, as represented by the accompanying engraving, materially simplifies the methods heretofore used in performing this work; avoiding hand labor, reducing the cost, and producing the work in a more satisfactory manner, constitute the important advantages to be gained by its use.

THE CUTTER HEADS are perfectly balanced, each 30″ diameter, provided with three flat knives supplied with chip breakers, which are set at the proper angle to produce a shear cut, capable of taking a cut 20″ long at the longest and shorter, which covers every requirement for this work; the faces and outside diameters are turned true and finished.

THE SPINDLE is 1⅞″ diameter, of hammered steel, running in genuine babbitt metal bearings, each provided with sight feed oil cups.

THE TABLE is planed true over the entire surface, and supplied with adjustable gauges, and stops for regulating the depth, length of cut, and taper.

THE OPERATION is simple and quickly performed. The end of shaft or pole to be tapered is placed on the table between the parallel guide and cutter head, and moved toward the spindle until the stop or end gauge is reached. By repeating this operation with the opposite head both sides of the shaft or pole are finished without turning over or reversing the work.

THE COUNTER is a portion of the machine, having tight and loose pulleys 10″ × 6″; speed, 800 revolutions per minute; can be belted from above, below, or either side.

HORSE POWER to drive, 3; floor space occupied, 48″ × 48″.

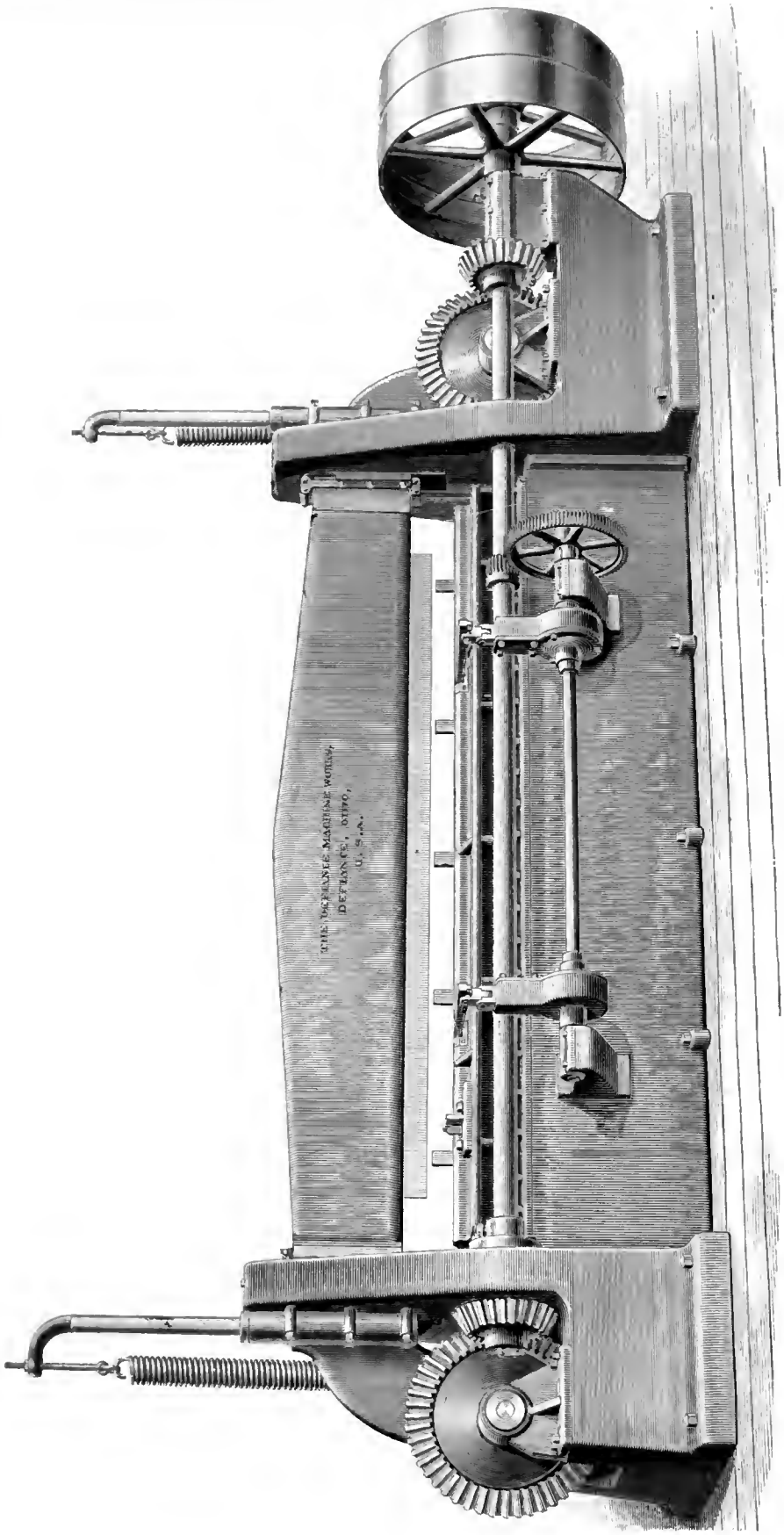
Suggestions Regarding Practice and Treatment of Wood Bending.

In justice to our patrons we feel that we cannot dismiss this subject of bending wood without giving some hint, in the brief space here allotted, to a few points of vital interest to the operator; and without a knowledge of which his difficulties cannot but be greatly magnified. Let him bear in mind that the outer arc of timber, in the process of bending, cannot be at all elongated without incurring danger of rupture. An absolute and rigid measure of "upset" must therefore be secured, with no more "release" than is due to the difference in the lengths of the arcs described by the masterstrap and the minorstrap. This difference should be the same for all kinds of timber, whether dense or cellular, hard or soft; and it should be the same for all dimensions of timber. Success can only be attained by securing this feature with the closest mechanical accuracy. We have accomplished this object, if adjustments be cared for, so that disappointment need never follow. It is automatically provided for, and is therefore unvarying. Too much importance cannot be claimed for this feature, without which more losses of timber are incurred than from all other causes combined; admitting that the steaming be always properly done.

To give precise directions for the steaming of timber, as to the time and intensity, is hardly possible. Varying density of timber, varying degrees of seasoning, and variations in the heat and moisture of the steam, conspire to throw the manager largely on his judgment. He is quite likely to err on the side of excessive steaming and thus "cook" or "kill" the timber. All woods possess a mucilaginous property which should not be changed by heat beyond the point of coagulation.

On the other hand equal care should be exercised that thorough saturation be secured, and that the steam be sufficiently laden with moisture to insure this object. The shortest time in which the steaming can be thoroughly effected, without overheating, is the desired practice.

Drawings and instructions, explaining more fully the adjustments of parts of the machine, will accompany shipment.



No. 1 Patent Automatic Hoop and Basket Strip Cutting Machine.

Export Shipping Weight, 12,000 Pounds.
Net Weight, 10,000 Pounds.
Cubic Measurement, 425 Feet.
Cable Word, HOOZOO.

No. 1 Patent Automatic Hoop and Basket Strip Cutting Machine.

Export Shipping Weight, 12,000 Pounds.

Net Weight, 10,000 Pounds.

Cubic Measurement, 425 Feet.

Cable Word, HOOZOO.

THIS ENGRAVING represents our No. 1 Patent Automatic Hoop and Basket Strip Cutting Machine, especially designed for rapidly and accurately cutting strips from the plank, suitable for coiled barrel and keg hoops with thick and thin edges, or it will cut parallel, that is, the same thickness on both edges, cutting material from the shortest length up to 8 feet, and from 3″ wide to sizes under in the different thicknesses. It will cut strips from hard or soft lumber true and smooth, and it is the first automatic machine of this kind for which this can be claimed.

THE FRAME, of neat design, is constructed of heavy cored sections neatly fitted together, of sufficient weight to stand firm, free from jar or tremble when doing the heaviest class of work. A foundation of masonry is required and it should be 4 feet wide, 15 feet long.

THE CUTTER BAR is a massive casting with cored center of ample strength to do its work with ease. It is fitted through the main frame in planed and scraped ways, and supported at each end upon heavy eccentrics which are driven by heavy cut gearing which are almost noiseless in operation. By an ingenious method the cutter bar is balanced at all positions, enabling it to run with the greatest ease, free from shock or jar, cutting the material smoothly and more accurately, with less power, than any other known method. The oscillating movement of the bar, secured by the use of the eccentrics, overcomes all tendency to injure the lightest and most delicate material and greatly lengthens the life of the cutters.

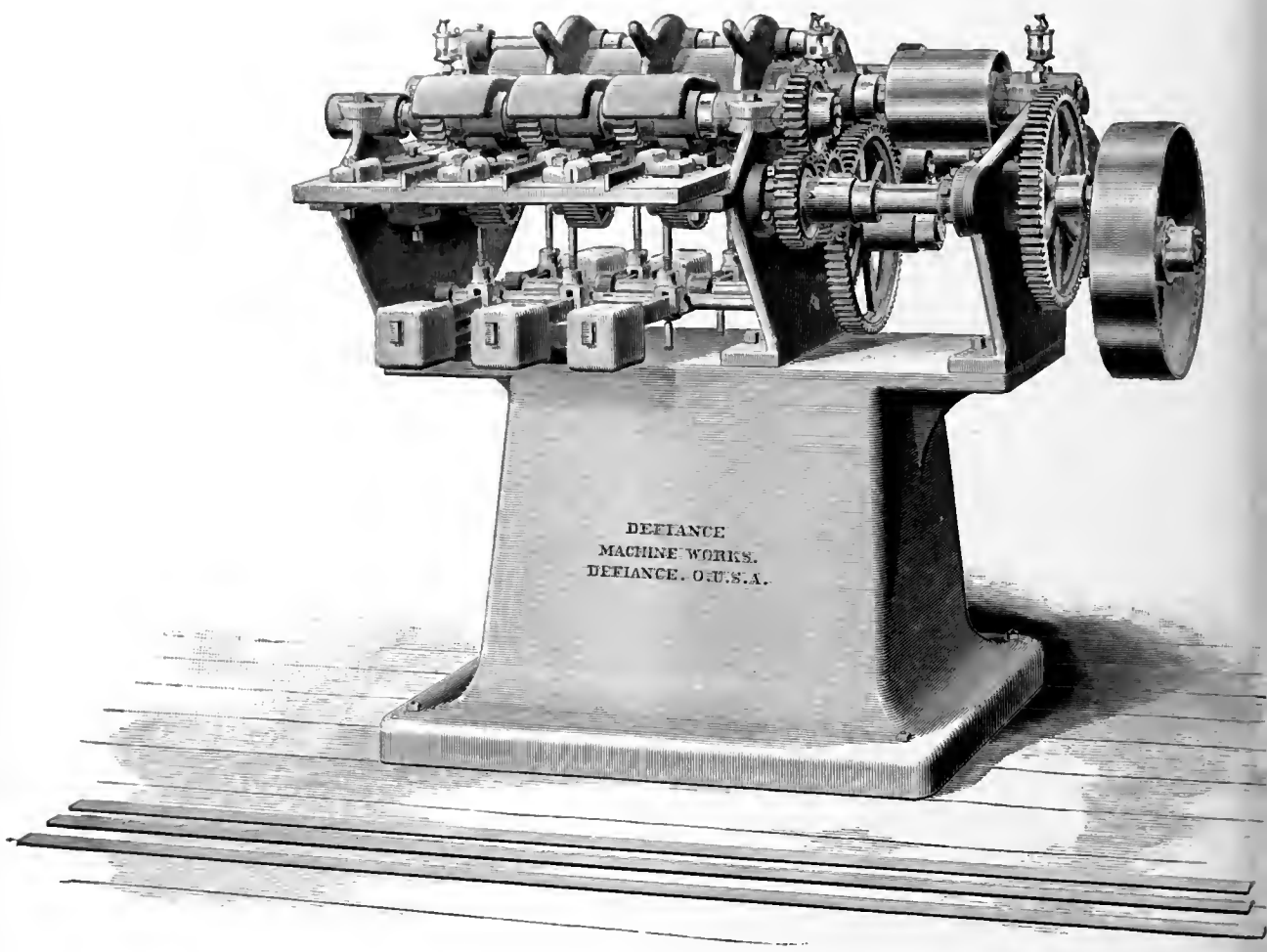
THE TABLE, upon which the material is placed while being operated upon, is fitted with a cam movement incased in iron jackets and driven by cut gearing for the purpose of securing a tilting movement used for cutting hoop strips with thick and thin edges. It is automatic and operates in exact time with the cutter. When cutting strips of equal thickness, the table is stationary. The five flat steel guide bars have a vertical movement with the cutter and are used to regulate the thickness of material to be cut. They can be adjusted for different thicknesses of work.

THIS MACHINE is fitted with the greatest care throughout, with removable bearings which can be renewed with small expense in case of wear. All important wearing surfaces are self-oiling.

THE CAPACITY of this machine is about 60,000 hoops or strips in ten hours, and with good lumber all the work should be perfectly accomplished.

THE TIGHT AND LOOSE PULLEYS are 36″ diameter, 8″ face, and should run 300 turns per minute. The loose pulley is fitted with bronze bushes and self-oiling cups.

HORSE POWER to drive, 8; floor space occupied, 48″ × 216″.



No. 1 Patent Automatic Triple Hoop Planer.

Export Shipping Weight, 2,400 Pounds.

Net Weight, 1,900 Pounds.

Cubic Measurement, 78 Feet.

Cable Word, PENO.

No. 1 Patent Automatic Triple Hoop Planer.

Export Shipping Weight, 2,400 Pounds.
Net Weight, 1,900 Pounds.
Cubic Measurement, 78 Feet.
Cable Word, PENO.

THIS ENGRAVING represents our No. 1 Patent Automatic Triple Hoop Planing Machine which has been designed to increase the quantity and improve the quality of work over other machines offered for the same purpose. It is so arranged to plane three hoops at one time at the rate of 35,000 per day of ten hours, with one operator to handle it. Its simplicity and increased capacity make it especially desirable for hoop mills of the largest kind.

THE FRAME is a neat, substantial casting in one piece, with cored center and broad floor base to stand firm. All the working parts are correctly fitted to it.

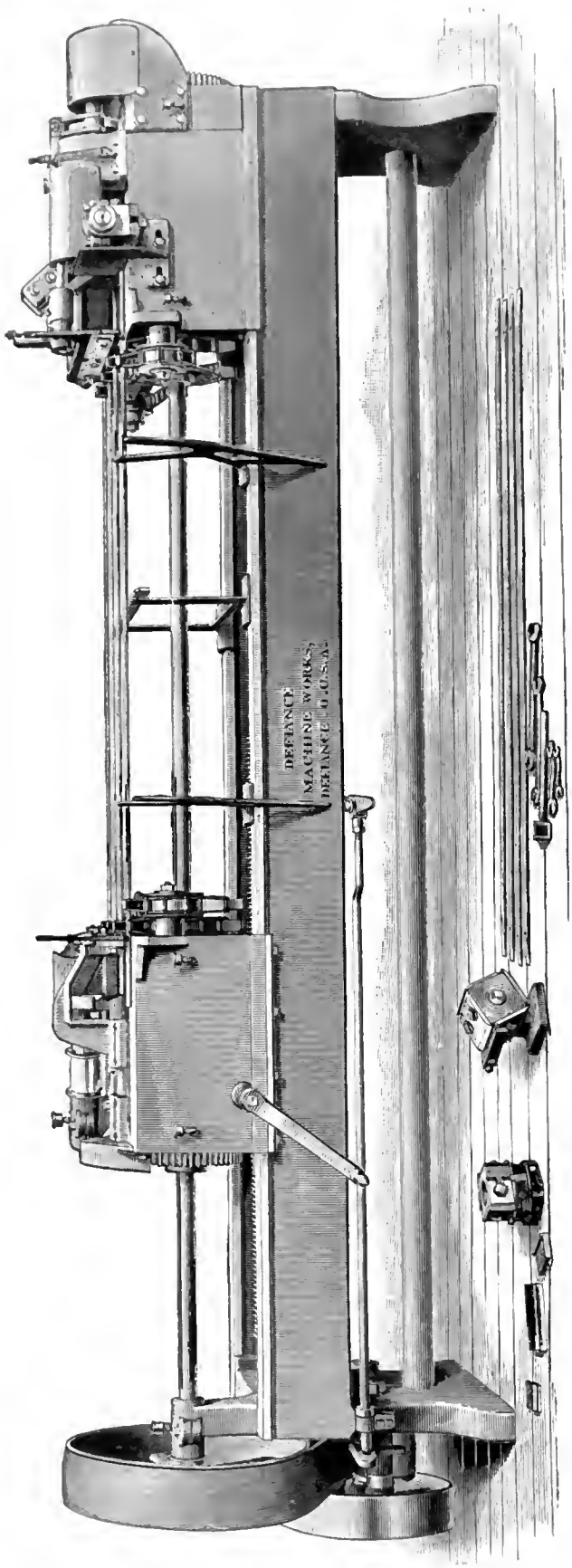
THE CUTTER HEAD SPINDLE, of steel, large in diameter, is provided with three bearings. It is provided with 12 live feed-rolls, six above and six below the table, located close up to the cutters to properly hold and feed the hoops and prevent clipping the ends. Each cutter head is supplied with a bonnet, which is fitted with a hardened tool-steel die that rests on the hoop just ahead of the cut. These bonnets as well as the upper feed-rolls can be instantly thrown back out of the way, giving free access to the cutter heads, and by loosening a single screw the outer bearing to the main spindle can be removed, the cutter heads slipped off, and the other set placed in, all of which does not consume over a moment's time.

AN INGENIOUS DEVICE is furnished for setting the knives in the heads before the heads are placed into the machine, consequently a set of heads can always be kept ready when a change of heads is necessary, always keeping the machine supplied with sharp knives without loss of time.

THE KNIVES used in this machine have the shape and size of hoop milled their full length, so that in sharpening they are ground straight over. All the gears are cut, which enables the machine to run smooth, free from noise, and gives a steady motion to the feed rolls.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}''$ diameter, 58″ long; two 20″ ball and socket adjustable hangers; 1 driving pulley, $18'' \times 6''$; 1 pulley to drive feed, $6'' \times 4\frac{1}{2}''$; tight and loose pulleys, $12'' \times 6''$; speed, 1,200 rotations per minute.

HORSE POWER to drive, 5; floor space occupied, $40'' \times 50''$.



No. 1 Patent Automatic Hoop Pointing and Lapping Machine.

Export Shipping Weight, 5,000 Pounds.

Net Weight, 3,500 Pounds.

Cubic Measurement, 267 Feet.

Cable Word, HAZING.

No. 1 Patent Automatic Hoop Pointing and Lapping Machine.

Export Shipping Weight, 5,000 Pounds.

Net Weight, 3,500 Pounds.

Cubic Measurement, 267 Feet.

Cable Word, HAZING.

THIS ENGRAVING represents our No. 1 Patent Automatic Hoop Pointing and Lapping Machine, which has been designed especially for the use of coiled hoop makers for rapidly and accurately equalizing, pointing, lapping, and scarfing hoops, such as used on slack barrels and kegs, doing the several operations at one and the same time, at the rate of 60,000 hoops per day.

NO SAWS are employed to do the work, but instead, shear-cutting knives, which cut and plane the work clean and perfectly smooth without tearing or slivering the material.

THIS MACHINE is of sufficient size and provided with necessary adjustments to accommodate from the shortest to the longest work, and in the different thicknesses and widths. All the adjustments for length of hoops can be made while the machine is in motion, and the simplicity of all the parts is such that inexpensive labor can handle the machine successfully.

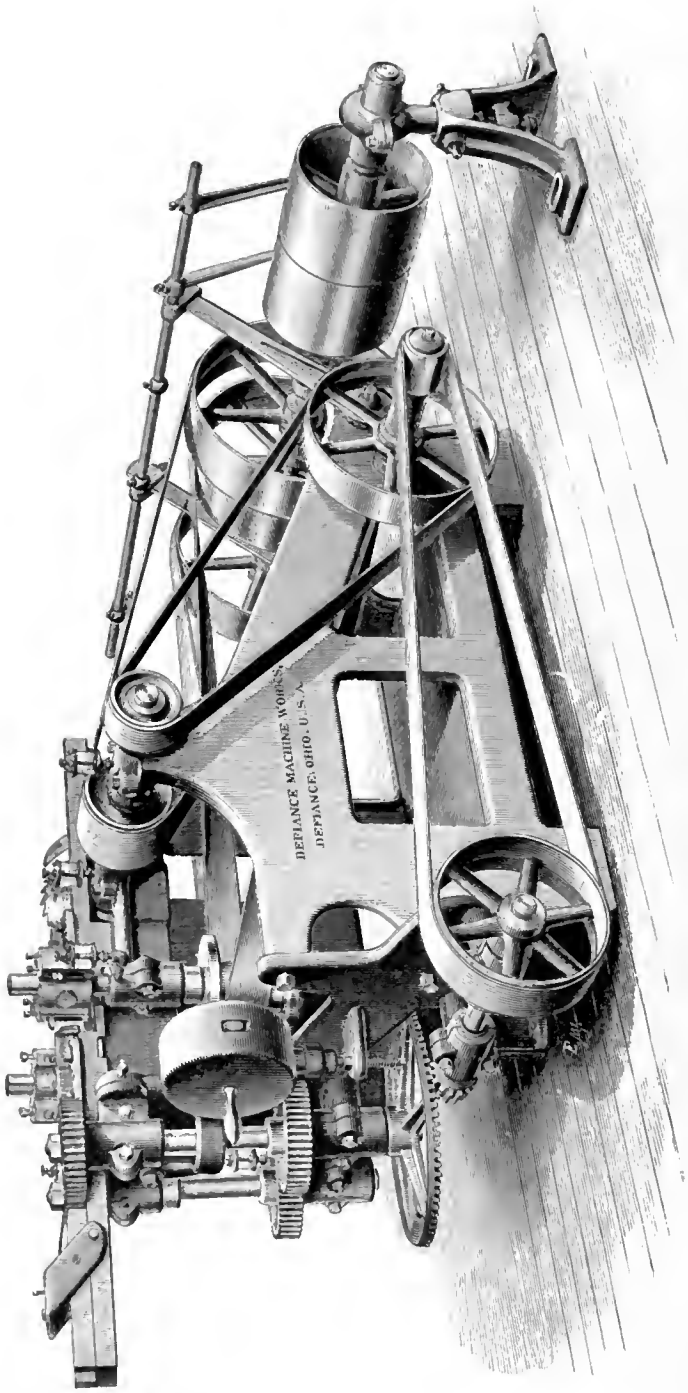
THE FRAME is constructed of heavy cored castings with a broad floor support. The top is planed true to receive the saddles, which are gibbed to it. The working parts are driven by link belting running over sprocket wheels with cut teeth, insuring absolute uniformity in the movement of the several departments.

THE HOOPS to be operated upon are placed into the machine, which automatically feeds them forward to the equalizing and pointing knives, where they stop just long enough for the cutters to accomplish their work, when they again continue to feed forward to the lapping cutters, which complete the work and the finished product is discharged at the rear side of the machine.

THE CAPACITY of this machine is much larger than that of any other machine intended for the same purpose, but the most important gain effected by this new machine is in the perfect quality of work which it produces, and the quickness and ease of adjustments. All the wearing surfaces are heavy and well constructed, requiring no repairs.

THE COUNTER is furnished as follows: Shaft, $1\frac{15}{16}'' \times 13$ feet long; three No. 2 ball and socket adjustable hangers; driving drum, $20'' \times 48''$ long; one driving pulley, $20'' \times 5''$, for driving right hand cutter head; driver for feed, $3\frac{3}{8}'' \times 4\frac{1}{4}''$; tight and loose pulleys, $12'' \times 6''$; speed, 700 rotations per minute.

HORSE POWER to drive, 5; floor space occupied, $48'' \times 156''$.



Kettenring's Patent Automatic Sawed Hoop Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 63 Feet.

Cable Word, HARPOON.

Kettenring's Patent Automatic Sawed Hoop Machine.

Export Shipping Weight, 1,500 Pounds.
Net Weight, 1,000 Pounds.
Cubic Measurement, 63 Feet.
Cable Word, HARPOON.

THE KETTENRING PATENT AUTOMATIC HOOP MACHINE, as shown by the engraving, is used for making sawed hoops for barrels and kegs. It will produce standard shapes with one thick and one thin edge, or plane equal thickness at both edges, or any other shape can be made, and it is not limited to any particular length of work or size of hoop.

THIS MACHINE is automatic in its movements, simple in adjustment, and practical in operation. With a single operator it will produce 15,000 hoops in ten hours.

IT HAS reached the highest standard of perfection as a labor saving machine for hoop making, and by its use the cost of manufacturing hoops has been reduced fully 50 per cent over machines used previous to its introduction, and it has almost entirely superseded every other form of machine for making sawed hoops.

THE BODY OF THE MACHINE is a heavy casting of neat design, well braced and very stiff.

THE CUTTER HEADS are fitted upon heavy steel spindles, standing vertically, on each side of the table immediately behind the feeding rolls, and in advance of the saw, and they are supplied with improved knives.

THE FEED ROLLS are strong and powerfully geared, and the feed is of the most rapid and positive kind. A flexible pressure of the rolls upon the work is produced by a weighted lever. A countershaft is placed at the rear end of the machine, and the cutter heads, saw, and feed rolls are driven from it by separate belts.

THE MATERIAL for this machine is prepared in the form of a bar $\frac{11}{16}$" thick, $1\frac{7}{16}$" wide, 6 feet 6" long for standard barrel hoops, which allows a surplus of $\frac{1}{32}$" to plane off at sides and edges, each bar making two standard hoops $\frac{3}{8}$" thick by $1\frac{3}{8}$" wide. We recommend for economy and desirable work the use of our improved chuck bar pointing machine, which cuts a handsome round point upon the bar. This machine should be located convenient to the hoop machine.

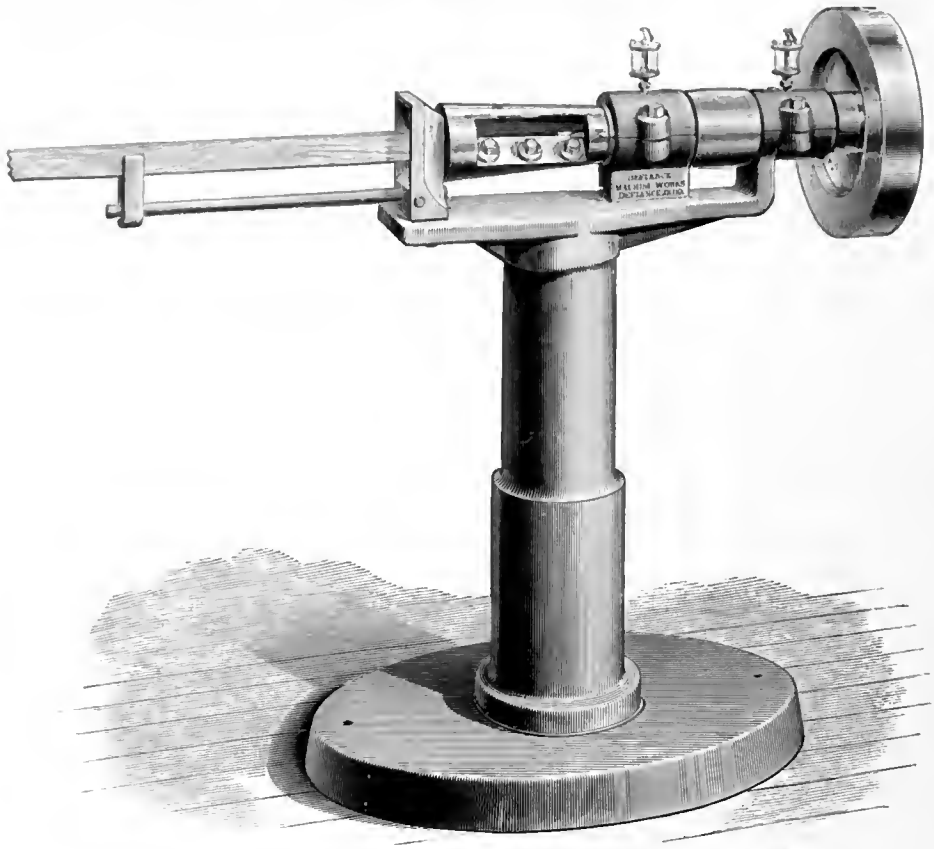
A SINGLE OPERATOR will handle both machines. One end of the bar is first pointed, when, without leaving the operator's hands, it is fed into the hoop machine, which planes both sides and the edges, and the saw located beyond the cutter heads splits the bar through the center at an angle to form a thick and thin edge. Two hoops are thus finished, including the pointing, from each bar.

THIS SYSTEM of sawed hoop making will produce 3,000 perfect barrel hoops from 1,000 feet of lumber, and the expense of steaming the plank (which is necessary with cut hoop machines) is entirely avoided.

A SAWED HOOP commands a higher price than a cut hoop, and they can be made smoother, free from checks, and at much less expense.

THE COUNTER is furnished as follows: Shaft, $1\frac{11}{16}$" × 48"; one No. 1 $1\frac{11}{16}$" floor stand; tight and loose pulleys, 10" × 6"; driver for cutter heads, 16" × $3\frac{1}{2}$"; driver for saw, 18" × 4"; speed, 1,000 revolutions per minute.

HORSE POWER to drive, 8; floor space occupied, 36" × 102".



No. 2 Improved Hoop Bar Chuck Pointing Machine.

Export Shipping Weight, 1,000 Pounds.
Net Weight, 600 Pounds.
Cubic Measurement, 23 Feet.
Cable Word, HOWELL.

THIS MACHINE is used by the manufacturers of coiled barrel and keg hoops for cutting a round taper point, similar to the point of a lead pencil, upon one end of a hoop bar previous to entering the hoop machine. This is one of a series of five machines required to form a complete outfit of the celebrated Defiance Sawed Hoop Machines.

ONE OPERATOR LESS is required by the use of this machine. The same operator that handles the hoop planer should perform the pointing of the bar by having the machines placed close together. The bars are $\frac{11}{16}'' \times 1\frac{7}{16}''$, which is of sufficient size to produce two standard $1\frac{3}{8}'' \times \frac{3}{8}''$ hoops, which are first pointed and then fed into the hoop planer.

IT CUTS SMOOTH, and has double the capacity of a wheel pointer, and after the hoops are planed the round edges terminate gradually with a round point, which makes a handsome finish.

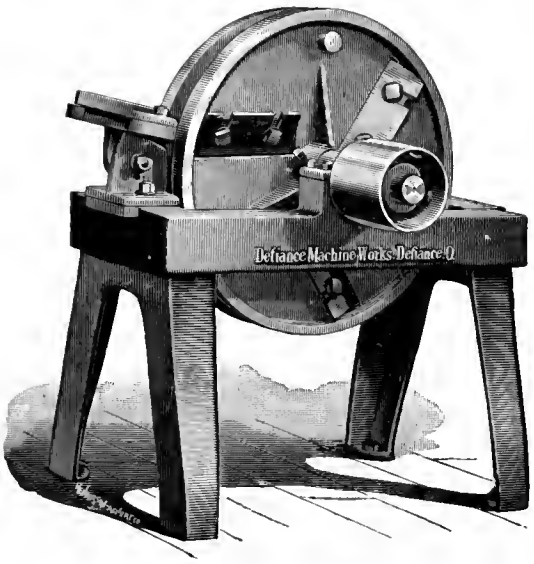
THE FRAME, being a single casting in pedestal form, combines neatness and convenience with great strength.

THE CUTTER HEAD SPINDLE is of large diameter, and runs in genuine babbitt metal, self-oiling bearings. At the rear end a nicely finished balance wheel is fitted.

THE CUTTER HEAD is of an improved kind, is thoroughly balanced, and contains a knife having a draw cut and a lipped end to round over the point; an adjustable gauge pin is fitted into the center of the head to regulate the diameter and length of point.

THE COUNTER is furnished with tight and loose pulleys, $10'' \times 5''$; speed, 700 rotations per minute.

HORSE POWER to drive, 3; floor space occupied, $24'' \times 36''$.



No. 2 Hand-Feed Patent Hoop Pointing Machine.

Export Shipping Weight, 1,200 Pounds.
Net Weight, 800 Pounds.
Cubic Measurement, 39 Feet.
Cable Word, HOWARD.

THE ENGRAVING fully explains the substantial manner in which our Patent Hoop Pointing Machine is constructed; designed especially for cutting a point on slack barrel hoops, making both sides of the point at one operation; capable of performing the work with accuracy in the shortest time possible; containing no complicated parts, and can be successfully operated by a boy.

THE FRAME is cast iron of neat design, provided with a substantial floor support.

THE ARBOR BOXES are made in halves, each provided with caps and lined with genuine babbitt metal. The lower half of the boxes are cast solid to the frame.

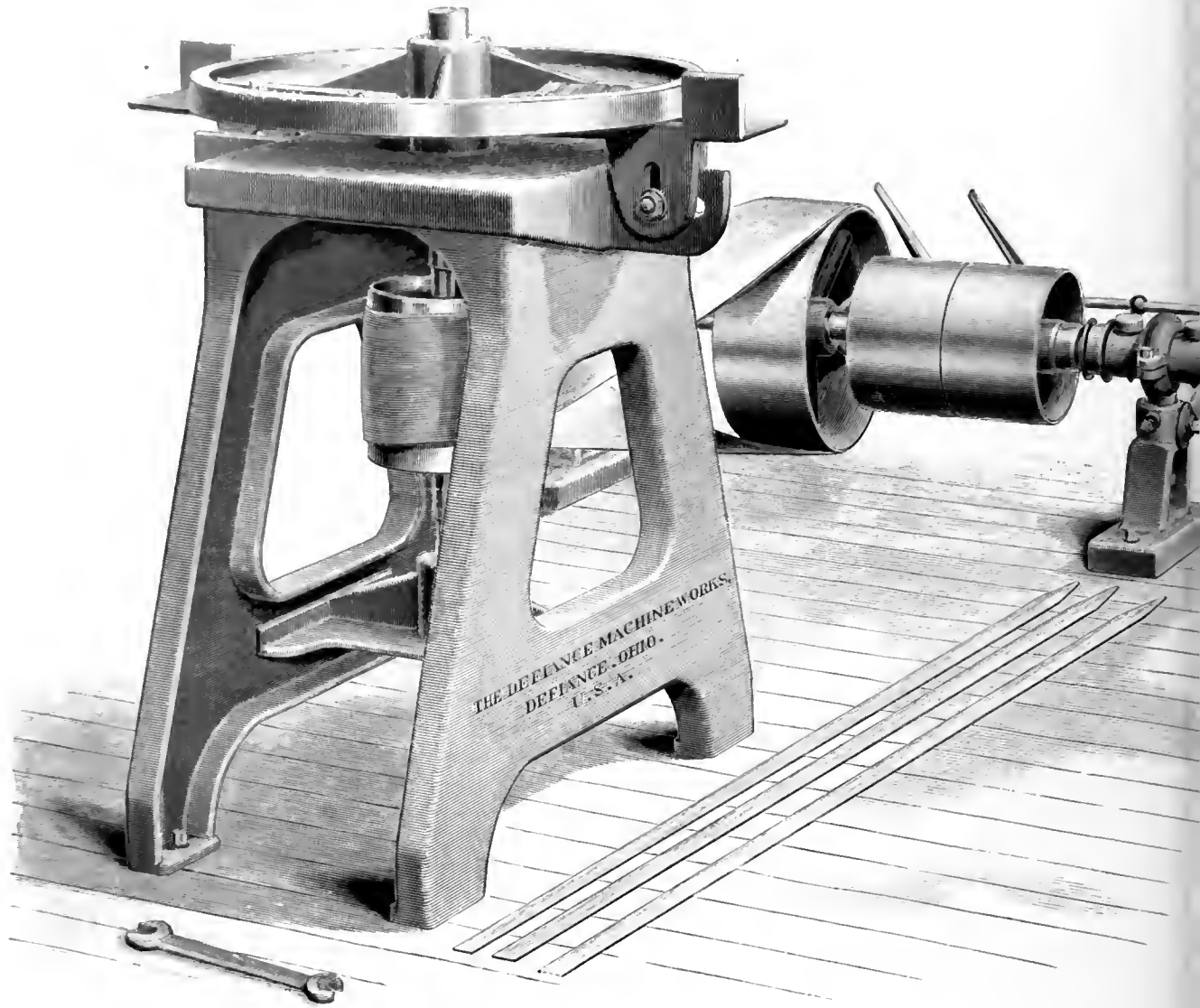
THE CUTTER HEADS are 24″ diameter, with faces and outside diameters accurately turned and finished, each containing three flat straight faced knives 9″ long, standing at the proper angle to produce a shear cut. The heads are balanced by our patent centrifugal balancing machine, and are warranted to be free from vibration or jar when running at high speed.

THE SPINDLE, to which the cutter heads are attached, is $1\frac{3}{8}$″ diameter, of hammered steel. The heads can be set to or from each other for various width hoops, capable of making points to 9″ at the longest.

THE TABLE, on which the hoops are held, extends between the heads the full length of the knives, properly supporting the hoop at the cutting points, having an adjustment, up or down, for regulating the length of point.

THE COUNTER is furnished as follows: Shaft, $1\frac{3}{8}$″ diameter, 48″ long; two No. 1 hangers; one driving pulley, 16″ × 6″; tight and loose pulleys, 10″ × 6″; speed, 450 revolutions per minute; pulley on spindle, 6″ × 6″; speed, 1,200 revolutions per minute.

HORSE POWER to drive, 3; floor space occupied, 24″ × 36″.



No. 2 Hand-Feed Patent Hoop Lapping Machine.

Export Shipping Weight, 950 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 32 Feet.

Cable Word, HUDSON.

No. 2 Hand-Feed Patent Hoop Lapping Machine.

Export Shipping Weight, 950 Pounds.

Net Weight, 700 Pounds.

Cubic Measurement, 32 Feet.

Cable Word, HUDSON.

THIS ENGRAVING represents our No. 2 Hand-Feed Patent Hoop Lapping Machine, especially designed for lapping the ends of coiled barrel and keg hoops, preparing them for the Coiling Machine. It is capable of lapping from 15,000 to 18,000 hoops in ten hours.

THE FRAME is a substantial casting of neat design, well braced and provided with a broad floor support to stand firm.

THE CUTTER HEAD is 24″ diameter and supplied with three shear-cutting knives standing at the proper angle to produce a smooth cut without tearing. It will cut a lap up to 10″ long and shorter. It is supported upon the end of a steel spindle $1\frac{15}{16}$″ diameter, which runs in long self-lubricating genuine babbitt metal bearings, with adjustments to take up for wear.

THE TABLES, on which the hoops are placed while being operated upon, are planed true and provided with vertical adjustments to regulate the depth of cut, and a tilting adjustment to give the desired taper to the lap.

THIS MACHINE is usually provided with two tables so that two operators can work on the machine at the same time. At a small additional expense it can be fitted with two extra tables, thus permitting four operators working on the machine. So simple is this machine to handle that it can be successfully operated by the cheapest labor.

THE COUNTER is furnished as follows: Two ball and socket adjustable floor stands; one countershaft, $1\frac{15}{16}$″ × 48″; one driving pulley, 16″ × 6″; tight and loose pulleys, 10″ × 6″; speed, 600 turns per minute. Pulley on cutter head spindle, 8″ × 8″; speed, 1,200 rotations per minute.

HORSE POWER to drive, 4; floor space occupied, 48″ × 84″.

No. 1 Patent Hoop Coiling Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 87 Feet.

Cable Word, HOSE.

No. 1 Patent Hoop Coiling Machine.

Export Shipping Weight, 1,500 Pounds.

Net Weight, 1,000 Pounds.

Cubic Measurement, 87 Feet.

Cable Word, HOSE.

THIS ENGRAVING represents our No. 1 Patent Hoop Coiling Machine, which has been designed for accurately coiling slack barrel and keg hoops of various sizes and lengths, at the rate of from 15,000 to 18,000 per day.

IT IS CONSTRUCTED on a heavy iron frame cast in one piece, with a broad floor base to overcome vibration and jar to the working parts; all link and lever joints are provided with lugs which are turned true and fitted into reamed holes and held in position by washers, entirely relieving the cap screws from strain.

THE QUICK OPENING GATE facilitates the removal of defective hoops, and gives free access to the coiling drum and parts.

BY AN INGENIOUS PNEUMATIC CUSHION the carriage is returned without jar or noise, after having discharged the finished coil of hoops, which greatly increases the life of the machine and enables the operator to perform more and better work; weights and bumpers as a relief have proved unsatisfactory.

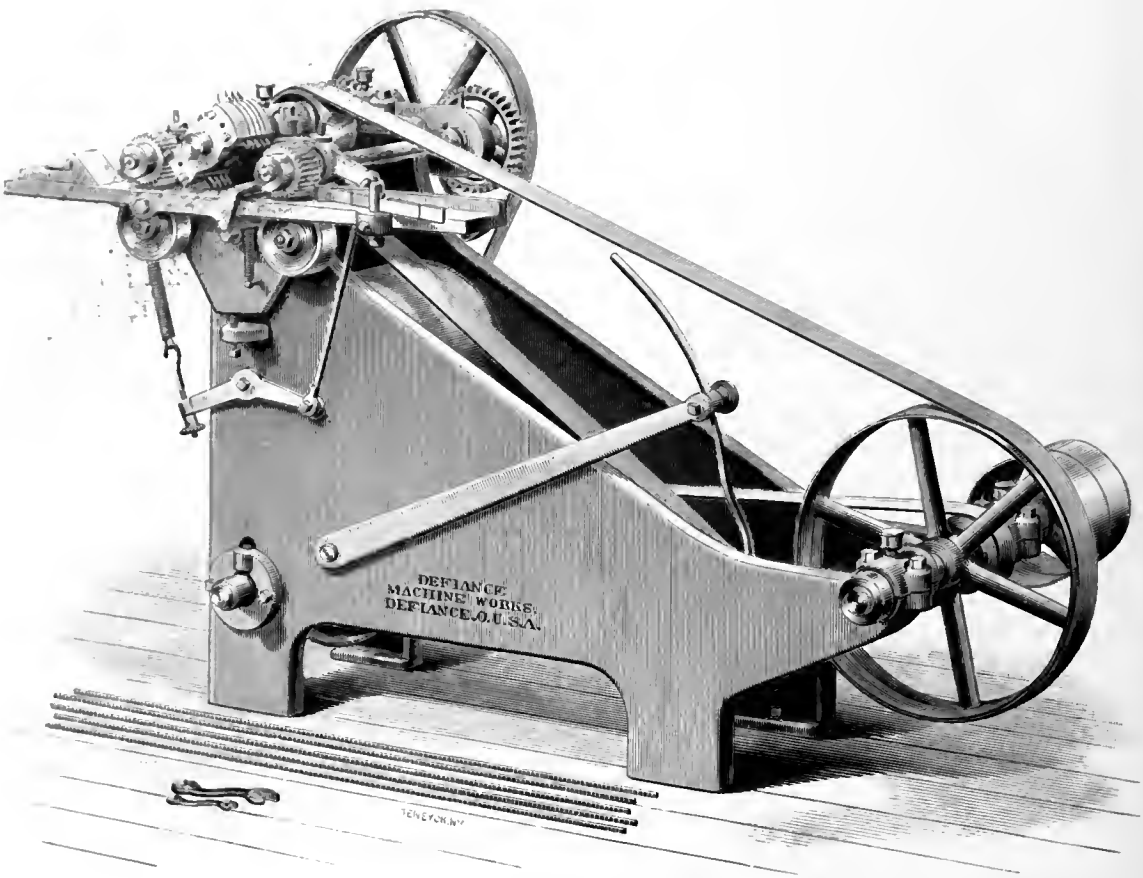
THE OPERATION of this machine is exceedingly simple; with no complicated parts or adjustments, it can be handled successfully by cheap labor; one end of the first hoop to be coiled is entered into an open jaw in the revolving drum while the machine is in operation, which firmly holds the end of the hoop to the drum when coiled around it; each succeeding hoop is fed into the machine at the proper time to allow the preceding hoop to form a lap; a steel band is used to prevent fracturing or buckling the hoops, and to bind the coil firmly together; the outer end of the last hoop is held to the coil by a single nail, a supply of which should be kept in the convenient nailing box attached to the support rail; when the coil is completed it is instantly discharged from the machine by the weight of the operator's foot upon the pedal.

BY A NEW AND NOVEL ARRANGEMENT the steel band or coiling strap may be removed for examination or repairs in a moment's time by simply releasing a set screw.

EACH MACHINE is fully tested in every particular before leaving our works, and guaranteed to have a larger capacity than any other similar machine, with less percentage of breakage in stock, with fewer and simpler parts, and costs less to maintain.

THE FRICTION CLUTCH for driving is located at the rear of the machine, and it is started and stopped by a convenient foot treadle; it is 18″ in diameter, 4″ face, and should run 100 rotations per minute; it can be belted to from above, below, or either side.

HORSE POWER to drive, 2; floor space occupied, 48″ × 48″.



No. 1 Improved Head Liner Planer.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 51 Feet.

Cable Word, PLANET.

No. 1 Improved Head Liner Planer.

Export Shipping Weight, 1,000 Pounds.

Net Weight, 600 Pounds.

Cubic Measurement, 51 Feet.

Cable Word, PLANET.

THE ACCOMPANYING ENGRAVING represents the most complete machine built for making head linings of various sizes, lengths, and shapes, such as are used to secure the heads in slack barrels. The demand for material of this class has increased within the past few years to such an extent that special machines with large capacities are required to produce them.

THE MATERIAL from which liners are made consists of defective and undersized hoops, staves, slabs, etc., and surplus which collects about a mill or factory, and is of no value other than for purposes of this character.

IT IS equally well adapted for making barrel hoops, hoops and handles for fruit and other baskets by simply using suitable knives, and removing the crimping attachment. It will plane one side and both edges of material with our improved knives, making either square or round corners.

THE MACHINE is simple in construction, automatic in its operation, can be handled successfully by a boy; it produces three liners, crimped and complete, at one time, having a capacity for making 50,000 liners per 10 hours.

THE FRAME is of neat design, cast cored style, with broad floor support to stand firm without jar or tremble.

THE BEARINGS are large, filled with genuine babbitt metal, and neatly fitted with cap boxes, each provided with self-lubricating oil cellars; in addition, self-regulating glass oil cups are furnished on cutter head boxes.

THE CUTTER HEAD contains two solid steel knives fitted in mortised holes, secured to the head by set screws at the outside of the head; thus the knives can be quickly removed or adjusted with accuracy without delay. In each knife three grooves are planed their entire length. The shape of grooves governs the size and shape of work. The edges of knives are ground straight over without the use of a file.

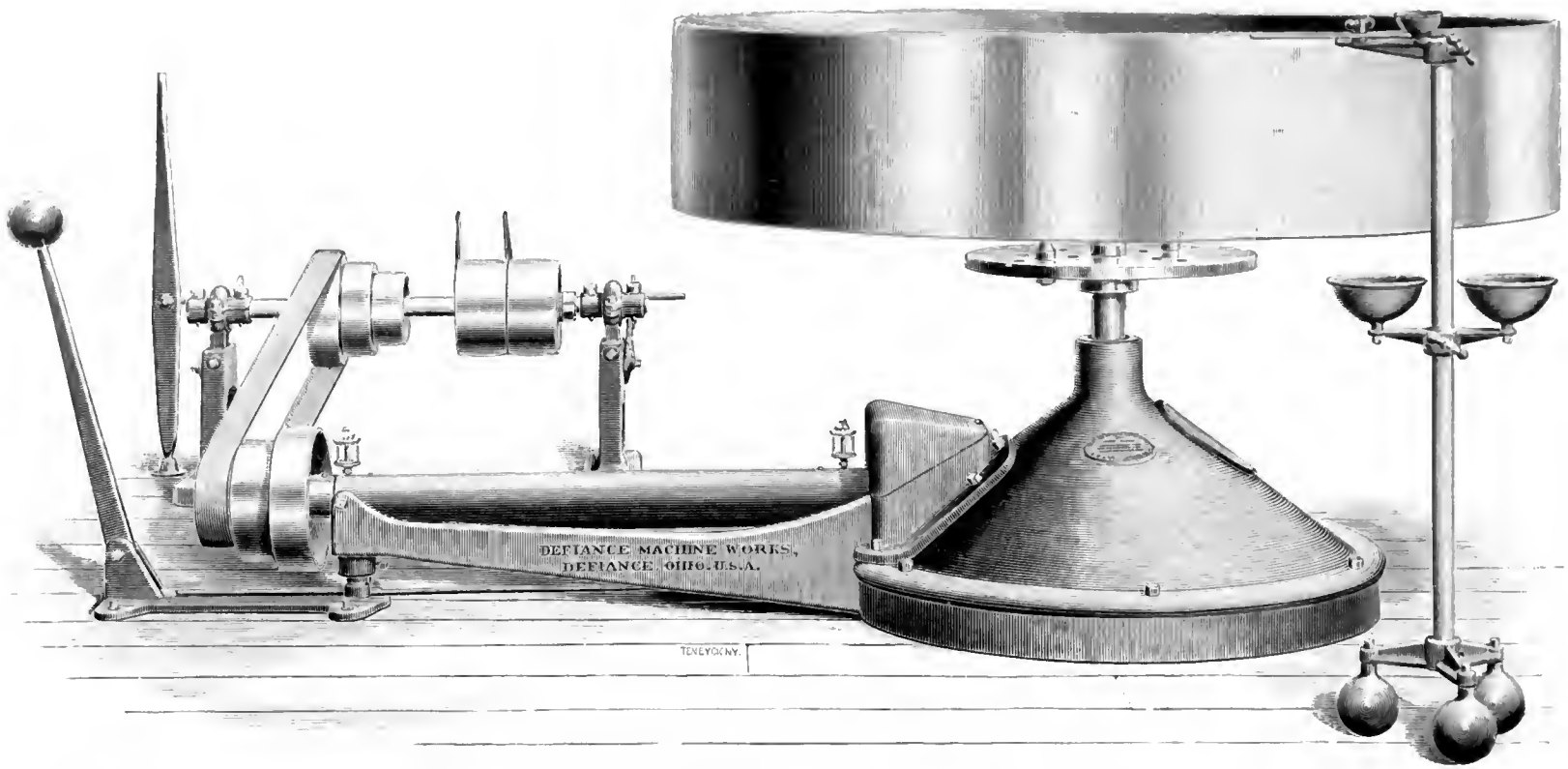
THE FEED is very powerful, driven from a sub-counter stationed under the machine. An idler pulley is attached to the end of a lever convenient to the operator for instantly starting or stopping the feed while the machine is in motion. The feed-roll spindles run in ball and socket lever boxes, to which an adjustable coiled spring is attached, for giving proper tension to the rolls. The rolls are placed as near the cutter head as possible, to admit feeding very short material.

THE TABLE is planed true, fitted to the frame in angle ways, provided with gib, adjustable up and down by screw for regulating depth of cut. The inner edge of table is raised above the face to form a guide. Two plain faced idler rolls, attached to the table immediately underneath each feed-roll, are used to prevent the face of the table from wearing uneven. A self-adjusting pressure bar is placed in advance of the cutter head, which hugs the material firmly to the table, thereby cutting cross-grained stock smooth without tearing.

THE WORK is performed so rapidly that an active boy is required to handle the machine to its fullest capacity. Various widths of material to 3″ at the widest, any length, can be fed into the machine. Hoops, trunk slats, and other similar material can be produced on this machine by simply changing the knives and removing the crimping attachment.

THE COUNTERSHAFT is a part of the machine, having tight and loose pulleys, 7″ × 3½″; speed, 1,180 revolutions per minute.

HORSE POWER to drive, 3; floor space occupied, 36″ × 60″.



No. 2 Seymour Patent Rotary Balancing Machine.

Export Shipping Weight, 5,000 Pounds.

Net Weight, 4,200 Pounds.

Cubic Measurement, 115 Feet.

Cable Word, BABYLONO.

No. 2 Seymour Patent Rotary Balancing Machine.

Export Shipping Weight, 5,000 Pounds.
Net Weight, 4,200 Pounds.
Cubic Measurement, 115 Feet.
Cable Word, BABYLONO.

THIS ENGRAVING represents the No. 2 Seymour Patent Rotary Balancing Machine, especially designed for perfectly balancing pulleys, fly-wheels, cutter-heads and other rotating parts of machinery not to exceed 2,500 pounds in weight. It is a special heavy machine, although it is capable of balancing the very lightest work.

THE FRAME is conical in form and cast in one piece, in the center of which is placed a vertical steel spindle standing in a step bearing in the base of the frame and passing a short distance above through a bearing at the top of the frame. This spindle, at its upper end, carries a face-plate provided with two driving-pins which project upward parallel to the axis of the spindle. A steel center with taper shank is fitted into the vertical spindle. Its upper end is reduced to a conical point and upon this rests the object to be balanced.

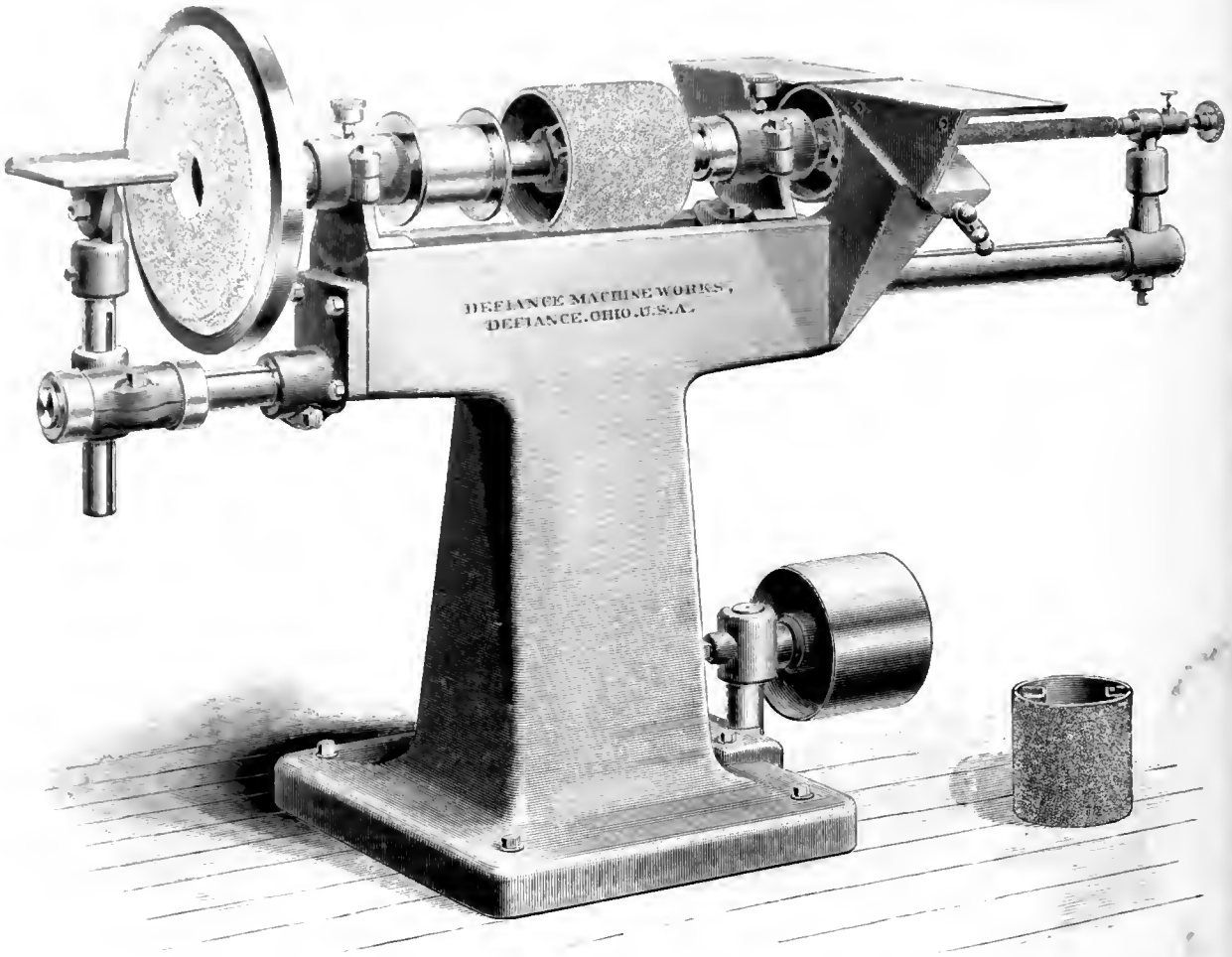
THE VERTICAL SPINDLE is rotated by frictional gearing driven by a horizontal shaft in suitable bearings at the base of the machine. This horizontal shaft is moved longitudinally by a counter-weighted lever so arranged that the weight may be used to press the frictions together when it is desired to rotate the object to be balanced and to disconnect them when it is desired to examine, test and mark the object while running alone, as the driving-pins are liable, when pressing against the arms of the object to be balanced, to produce uneven rotation. The true unbalanced condition is best shown when the disturbing influences of the motive power are withdrawn when the frictions are released.

TO BALANCE any object, a plug is first secured, having a conical cavity at one end, which is secured to the bored hole of the hub slightly above the center of gravity of the object to be balanced; then secure a standing balance first before starting the machine, by attaching balancing weights by the usual method. Then rotate the object, observing and marking the part which runs out, and, by adjusting the weights in a vertical plane only, the running balance is secured without destroying the standing balance.

THIS MACHINE is well adapted for determining all the conditions necessary to perfect rotating balances, even at the highest velocity, and by the aid of this machine more objects can be balanced in a given time than by the old method.

THE COUNTER for this machine is furnished as follows: Two No. 2 floor stands; shaft $1\frac{1}{8}''$x48″; journals $1\frac{7}{16}''$; cone pulley, 8″, 10″ and 12″ steps; tight and loose pulleys 10″×5″; speed 2,000 turns per minute.

HORSE POWER to drive, 3; floor space occupied, 48″ × 114″.



No. 1 Metal Grinding and Polishing Machine.

Export Shipping Weight, 1,250 Pounds.
Net Weight, 900 Pounds.
Cubic Measurement, 40 Feet.
Cable Word, GENESEE.

THIS ENGRAVING represents our No. 1 Combination Metal Grinding and Polishing Machine which has proved a most useful and convenient tool for metal workers. It is equipped with a solid emery disc, set into a metal ring, used for grinding and truing up iron and steel pieces of various kinds, such as used in machine construction. It is also fitted with two polishing drums used for finishing flat and irregular surfaces and a small, round emery rod for polishing small curves. An emery belt can be used over the pulley at the base of the machine, and the one underneath the tables, which for some classes of work is more desirable than the drum, as the polishing or cutting surface is greatly increased.

THE FRAME is heavy and substantial, cast in one piece with cored center and a broad floor base to stand firm.

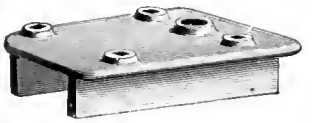
THE EMERY DISC is 16″ diameter and it is provided with a swinging adjustable table which is planed true on top. It can be used to carry the work across the face of the disc or as a stationary table.

THE POLISHING DRUMS are 6″ × 6″ and 7″ × 7″ of improved construction, so arranged that the emery cloth can be quickly placed on or removed. The tables over the smaller drum are planed true and provided with a vertical adjustment to regulate the depth of cut. Various sizes of polishing rods can be used to suit different requirements.

THIS MACHINE is indispensable for shaping and finishing cutters, dies, keys, and various other small parts of machinery.

THE COUNTER is furnished as follows: Shaft, $1\frac{1}{16}$″ × 40″; two No. 1 $1\frac{1}{16}$″ hangers; driving pulley, 20″ × 4″; tight and loose pulleys, 10″ × 6″; speed, 475 rotations per minute.

HORSE POWER to drive, 3; floor space occupied, 24″ × 70″.



Cast Iron Reach Plates.

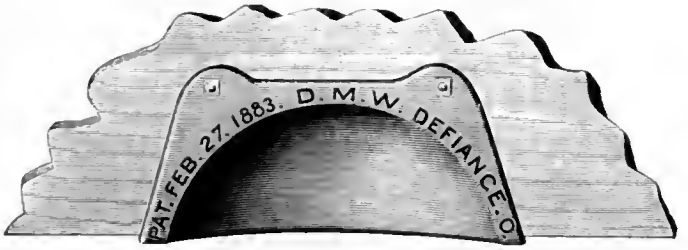
Cable Word, ROD.

No. 0, with Flanges for 3¼″ Reach. Price each, 15 cents.
No. 1, with Flanges for 3½″ Reach. Price each, 20 cents.
No. 2, with Flanges for 3¾″ Reach. Price each, 21 cents.
No. 3, with Flanges for 4″ Reach. Price each, 22 cents.
No. 7, with Flanges for 5″ Reach. Price each, 25 cents.
No. 8, with Flanges for 4½″ Reach. Price each, 24 cents.

Cast Iron Brake Block.

Cable Word, BILLOW.

THE ABOVE CUT shows an Improved Cast Iron Brake Block attached to a wooden Brake Shoe, which is fastened to the brake beam of a wagon by a single bolt through the square hole shown in the engraving. This hole is provided with square countersink for the bolt head to rest in. The wooden shoe is fitted to the iron block on a taper or wedge, which holds it in proper place; thus, when the wooden shoe becomes worn out, a new one can be supplied by simply slipping it into the socket without loosening a bolt. Price per pair, 10 cents.



The Dickman Patent Rub Iron.

THE ABOVE ENGRAVING represents the Dickman Patent Rub Iron, which is used on wagon boxes for the wheel to ride against when making a short turn. By its use it is impossible to lock the wheels in making a short turn. The concavity of this rub iron forms the arc of a circle corresponding to that of the wheel, whereby the wheel rim will have a bearing on all parts of the arc, which protects the tire and prevents it from wearing a hole in the wagon box. These patent irons will be found far superior to the common ones, and they are now used by the largest wagon manufacturers.

No. 1, Price per pair, 30 cents; Standard Size. **Cable Word, ROY.**

Common Rub Iron.

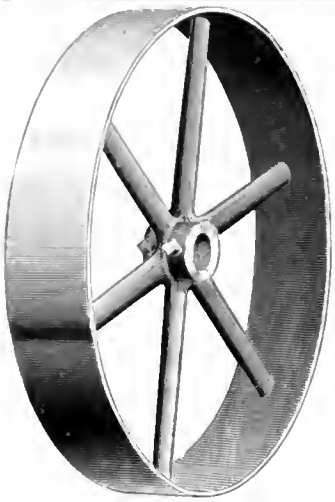
Cable Word, REIGN.

THIS ENGRAVING represents a Common Rub Iron used underneath the wagon bed to prevent the wheel from rubbing against the bed. Price per pair, 8 cents.

Iron Brake Box.

Cable Word, BIG.

THIS ENGRAVING represents an Iron Brake Box used underneath the wagon bed to support the brake rod. They are held to bottom of the bed by two small bolts. They are easily put on; are cheaper and look much better than a wooden box. Price per pair, 10 cents.



Patent Balanced Pulleys.

Cable Word, PUZZLE.

Diam.	Face.	Price.
6″	3″	$1 53
6″	4″	1 74
6″	5″	1 95
6″	6″	2 16
6″	7″	2 37
7″	3″	1 65
7″	4″	1 87
7″	5″	2 19
7″	6″	2 31
7″	7″	2 53
7″	8″	2 75
8″	3″	1 77
8″	4″	2 01
8″	5″	2 25
8″	6″	2 49
8″	7″	2 73
8″	8″	2 97
8″	9″	3 21
9″	3″	1 89
9″	4″	2 14
9″	5″	2 39
9″	6″	2 64
9″	7″	2 89
9″	8″	3 14
9″	9″	3 38
10″	3″	1 98
10″	4″	2 22
10″	5″	2 56
10″	6″	2 90
10″	7″	3 24
10″	8″	3 58
10″	9″	3 92
10″	10″	4 26
11″	3″	2 13
11″	4″	2 48
11″	5″	2 83
11″	6″	3 18
11″	7″	3 53
11″	8″	3 88
11″	9″	4 23
11″	10″	4 58
11″	11″	4 83
12″	3″	2 25
12″	4″	2 60
12″	5″	2 95
12″	6″	3 30
12″	7″	3 65
12″	8″	4 00
12″	9″	4 35
12″	10″	4 70
12″	11″	5 05
12″	12″	5 40
12″	13″	5 75
12″	14″	6 10
13″	3″	2 37
13″	4″	2 77
13″	5″	3 17
13″	6″	3 57
13″	7″	3 97
13″	8″	4 37
13″	9″	4 77
13″	10″	5 18
13″	11″	5 58
13″	12″	5 98
13″	13″	6 38
14″	3″	2 52
14″	4″	2 92
14″	5″	3 32
14″	6″	3 72
14″	7″	4 12
14″	8″	4 52
14″	9″	4 92
14″	10″	5 32
14″	11″	5 72
14″	12″	6 12
14″	13″	6 52
14″	14″	6 92
15″	3″	2 64
15″	4″	$3 04
15″	5″	3 44
15″	6″	3 84
15″	7″	4 24
15″	8″	4 64
15″	9″	5 04
15″	10″	5 44
15″	11″	5 94
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15″	14″	7 44
15″	16″	8 44
15″	18″	9 44
16″	3″	2 64
16″	4″	3 04
16″	5″	3 44
16″	6″	3 84
16″	7″	4 24
16″	8″	4 64
16″	9″	5 04
16″	10″	5 44
16″	11″	5 84
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19″	18″	11 19
20″	3″	3 09
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20″	5″	4 19
20″	6″	4 74
20″	7″	5 29
20″	8″	5 84
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20″	12″	7 99
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20″	16″	10 19
20″	18″	11 29
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20″	22″	13 49
20″	24″	14 59
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21″	4″	3 80
21″	5″	4 40
21″	6″	5 00
21″	7″	5 60
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21″	9″	6 80
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34″	14″	16 20
34″	16″	18 00
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34″	20″	21 60
34″	22″	23 40
34″	24″	25 20
34″	26″	27 00
34″	28″	28 80
34″	30″	30 60
36″	3″	6 94

Diam.	Face.	Price.	Diam.	Face.	Price.	Diam.	Face.	Price.	Diam.	Face.	Price.	Diam.	Face.	Price.
36″	4″	$7 84	42″	22″	$34 74	50″	16″	$35 55	58″	12″	$34 81	66″	9″	$35 91
36″	5″	8 74	42″	24″	37 46	50″	18″	39 15	58″	14″	38 81	66″	10″	38 53
36″	6″	9 64	42″	26″	40 18	50″	20″	42 75	58″	16″	42 81	66″	11″	41 15
36″	7″	10 54	42″	28″	42 90	50″	22″	46 35	58″	18″	46 81	66″	12″	43 87
36″	8″	11 44	42″	30″	45 62	50″	24″	49 95	58″	20″	50 81	66″	14″	49 11
36″	9″	12 34	42″	32″	48 34	50″	26″	53 55	58″	22″	54 81	66″	16″	54 35
36″	10″	13 24	44″	4″	11 17	50″	28″	57 15	58″	24″	58 81	66″	18″	59 59
36″	11″	14 14	44″	5″	12 63	50″	30″	60 75	58″	26″	62 81	66″	20″	64 63
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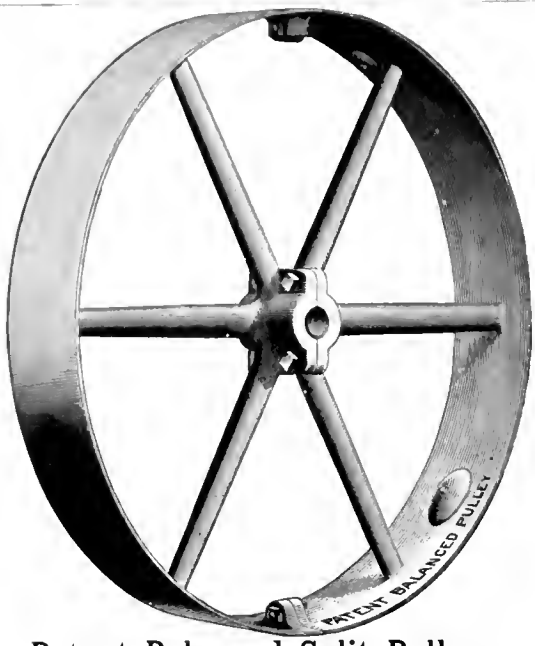
36″	14″	16 84	44″	7″	15 55	52″	5″	16 90	58″	30″	70 81	66″	24″	75 11
36″	16″	18 64	44″	8″	17 01	52″	6″	18 80	58″	32″	74 81	66″	26″	80 35
36″	18″	20 44	44″	9″	18 47	52″	7″	20 70	58″	34″	78 81	66″	28″	85 59
36″	20″	22 24	44″	10″	19 93	52″	8″	22 60	60″	6″	24 24	66″	30″	90 83
36″	22″	24 04	44″	11″	21 39	52″	9″	24 50	60″	7″	26 25	66″	32″	96 07
36″	24″	25 84	44″	12″	22 85	52″	10″	26 40	60″	8″	28 26	66″	34″	101 31
36″	26″	27 64	44″	14″	25 77	52″	11″	28 30	60″	9″	30 27	68″	6″	29 55
36″	28″	29 44	44″	16″	28 69	52″	12″	30 20	60″	10″	32 28	68″	7″	32 29
36″	30″	31 24	44″	18″	31 61	52″	14″	34 00	60″	11″	34 29	68″	8″	35 03
38″	3″	7 89	44″	20″	34 53	52″	16″	37 80	60″	12″	36 30	68″	9″	37 77
38″	4″	8 81	44″	22″	37 45	52″	18″	41 60	60″	14″	40 32	68″	10″	40 51
38″	5″	9 83	44″	24″	40 37	52″	20″	45 40	60″	16″	44 34	68″	11″	43 25
38″	6″	10 75	44″	26″	43 29	52″	22″	49 20	60″	18″	48 36	68″	12″	45 99
38″	7″	11 67	44″	28″	46 21	52″	24″	53 00	60″	20″	52 38	68″	14″	51 47
38″	8″	12 59	44″	30″	49 13	52″	26″	56 80	60″	22″	56 40	68″	16″	56 95
38″	9″	13 51	46″	4″	12 12	52″	28″	60 60	60″	24″	60 42	68″	18″	62 43
38″	10″	14 43	46″	5″	13 72	52″	30″	64 40	60″	26″	64 44	68″	20″	67 91
38″	11″	15 35	46″	6″	15 32	52″	32″	68 20	60″	28″	68 46	68″	22″	73 39
38″	12″	16 27	46″	7″	16 92	54″	5″	18 34	60″	30″	72 48	68″	24″	78 87
38″	14″	18 11	46″	8″	18 52	54″	6″	20 24	60″	32″	76 50	68″	26″	84 35
38″	16″	19 95	46″	9″	20 12	54″	7″	22 14	60″	34″	80 52	68″	28″	89 83
38″	18″	20 79	46″	10″	21 72	54″	8″	23 94	62″	6″	25 50	68″	30″	95 31
38″	20″	22 63	46″	11″	23 32	54″	9″	25 84	62″	7″	27 70	68″	32″	100 79
38″	22″	24 47	46″	12″	24 92	54″	10″	27 74	62″	8″	29 90	68″	34″	106 27
38″	24″	26 31	46″	14″	28 12	54″	11″	29 64	62″	9″	32 10	70″	6″	31 05
38″	26″	28 15	46″	16″	31 32	54″	12″	31 54	62″	10″	34 30	70″	7″	33 94
38″	28″	29 99	46″	18″	34 52	54″	14″	35 34	62″	11″	36 50	70″	8″	36 83
38″	30″	32 83	46″	20″	37 72	54″	16″	39 14	62″	12″	38 70	70″	9″	39 72
40″	3″	9 43	46″	22″	40 92	54″	18″	42 94	62″	14″	43 10	70″	10″	42 61
40″	4″	10 43	46″	24″	44 12	54″	20″	46 74	62″	16″	47 50	70″	11″	45 50
40″	5″	11 43	46″	26″	47 32	54″	22″	50 54	62″	18″	51 90	70″	12″	48 39
40″	6″	12 43	46″	28″	50 52	54″	24″	54 34	62″	20″	56 30	70″	14″	54 17
40″	7″	13 43	46″	30″	53 72	54″	26″	58 14	62″	22″	60 70	70″	16″	59 95
40″	8″	14 43	48″	4″	13 20	54″	28″	61 94	62″	24″	65 10	70″	18″	65 73
40″	9″	15 43	48″	5″	14 90	54″	30″	65 74	62″	26″	69 50	70″	20″	71 51
40″	10″	16 43	48″	6″	16 60	54″	32″	69 54	62″	28″	73 90	70″	22″	77 29
40″	11″	17 43	48″	7″	18 30	56″	6″	21 45	62″	30″	78 30	70″	24″	88 07
40″	12″	18 43	48″	8″	20 00	56″	7″	23 41	62″	32″	82 70	70″	26″	88 85
40″	14″	20 43	48″	9″	21 70	56″	8″	25 37	62″	34″	87 10	70″	28″	94 63
40″	16″	22 43	48″	10″	23 40	56″	9″	27 33	64″	6″	26 76	70″	30″	100 41
40″	18″	24 43	48″	11″	25 10	56″	10″	29 29	64″	7″	29 17	70″	32″	106 19
40″	20″	26 43	48″	12″	26 80	56″	11″	31 25	64″	8″	31 58	70″	34″	111 97
40″	22″	28 43	48″	14″	30 20	56″	12″	33 21	64″	9″	33 99	72″	6″	32 55
40″	24″	30 43	48″	16″	33 60	56″	14″	37 13	64″	10″	36 40	72″	7″	35 55
40″	26″	32 43	48″	18″	37 00	56″	16″	41 05	64″	11″	38 81	72″	8″	38 55
40″	28″	34 43	48″	20″	40 40	56″	18″	44 97	64″	12″	41 22	72″	9″	41 55
40″	30″	36 43	48″	22″	43 80	56″	20″	48 89	64″	14″	46 04	72″	10″	44 55
42″	4″	10 26	48″	24″	47 20	56″	22″	52 81	64″	16″	50 86	72″	11″	47 55
42″	5″	11 62	48″	26″	50 60	56″	24″	56 73	64″	18″	55 68	72″	12″	50 55
42″	6″	12 98	48″	28″	54 00	56″	26″	60 65	64″	20″	60 50	72″	14″	56 55
42″	7″	14 34	48″	30″	57 40	56″	28″	64 57	64″	22″	65 32	72″	16″	62 55
42″	8″	15 70	50″	5″	15 75	56″	30″	68 49	64″	24″	70 14	72″	18″	68 55
42″	9″	17 06	50″	6″	17 55	56″	32″	72 41	64″	26″	74 96	72″	20″	74 55
42″	10″	18 42	50″	7″	19 35	56″	34″	76 33	64″	28″	79 78	72″	22″	80 55
42″	11″	19 78	50″	8″	21 15	58″	6″	22 81	64″	30″	84 60	72″	24″	86 55
42″	12″	21 14	50″	9″	22 95	58″	7″	24 81	64″	32″	89 42	72″	26″	90 55
42″	14″	23 86	50″	10″	24 75	58″	8″	26 81	64″	34″	94 24	72″	28″	96 55
42″	16″	26 58	50″	11″	26 55	58″	9″	28 81	66″	6″	28 05	72″	30″	102 55
42″	18″	29 30	50″	12″	28 35	58″	10″	30 81	66″	7″	30 67	72″	32″	108 55
42″	20″	32 02	50″	14″	31 95	58″	11″	32 81	66″	8″	33 29	72″	34″	114 55



Patent Balanced Split Pulley.

Cable Word, POLE.

Diam.	Face.	Price.
12″	3″	$2 81
12″	4″	3 25
12″	5″	3 68
12″	6″	4 12
12″	7″	4 56
12″	8″	5 00
12″	9″	5 43
12″×10″		5 85
12″×11″		6 32
12″×12″		6 75
12″×13″		7 18
12″×14″		7 62
13″	3″	2 96
13″	4″	3 46
13″	5″	3 96
13″	6″	4 46
13″	7″	4 96
13″	8″	5 46
13″	9″	5 96
13″×10″		6 47
13″×11″		6 97
13″×12″		7 47
13″×13″		7 97
14″	3″	3 15
14″	4″	3 65
14″	5″	4 15
14″	6″	4 65
14″	7″	5 15
14″	8″	5 65
14″	9″	6 15
14″×10″		6 65
14″×11″		7 15
14″×12″		7 65
14″×13″		8 15
14″×14″		8 65
15″	3″	3 30
15″	4″	3 80
15″	5″	4 30
15″	6″	4 80
15″	7″	5 30
15″	8″	5 80
15″	9″	6 30
15″×10″		6 80
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15″×12″		7 80
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16″	4″	3 80
16″	5″	4 30
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16″	8″	5 80
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16″×12″		7 80
16″×14″		8 80
16″×16″		9 80
16″×18″		10 80
16″×20″		11 80
17″	3″	3 30
17″	4″	3 86
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17″	6″	4 98
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17″	9″	6 48
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17″×14″		8 98
17″×16″		9 98
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18″	4″	4 10
18″	5″	4 72
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19″	8″	7 11
19″	9″	7 80
19″×10″		8 48
19″×11″		9 17
19″×12″		9 86
19″×14″		11 23
19″×16″		12 61
19″×18″		13 98
19″×20″		15 36
20″	3″	3 86
20″	4″	4 55
20″	5″	5 23
20″	6″	5 92
20″	7″	6 61
20″	8″	7 30
20″	9″	7 92
20″×10″		8 61
20″×11″		9 30
20″×12″		9 98
20″×14″		11 36
20″×16″		12 73
20″×18″		14 11
20″×20″		15 48
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21″	7″	7 00
21″	8″	7 75
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21″×11″		10 00
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21″×14″		12 25
21″×16″		13 75
21″×18″		15 25
21″×20″		16 75
21″×22″		18 50
22″	3″	4 30
22″	4″	5 05
22″	5″	5 80
22″	6″	6 55
22″	7″	7 30
22″	8″	8 05
22″	9″	8 80
22″×10″		9 55
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22″×12″		11 05
22″×14″		12 55
22″×16″		14 05
22″×18″		15 55
22″×20″		17 05
22″×22″		18 55
23″	3″	4 45
23″	4″	5 20
23″	5″	5 95
23″	6″	6 70
23″	7″	7 45
23″	8″	8 20
23″	9″	8 95
23″×10″		9 70
23″×11″		10 45
23″×12″		11 20
23″×14″		12 70
23″×16″		14 20
23″×18″		15 70
23″×20″		17 20
23″×22″		18 70
24″	3″	4 65
24″	4″	5 40
24″	5″	6 15
24″	6″	$6 90
24″	7″	7 65
24″	8″	8 40
24″	9″	9 15
24″×10″		9 90
24″×11″		10 65
24″×12″		11 40
24″×14″		12 90
24″×16″		14 40
26″	3″	5 17
26″	4″	6 00
26″	5″	6 82
26″	6″	7 65
26″	7″	8 47
26″	8″	9 17
26″	9″	10 00
26″×10″		10 82
26″×11″		11 65
26″×12″		12 47
26″×14″		13 30
26″×16″		14 95
26″×18″		16 60
26″×20″		18 25
26″×22″		19 90
26″×24″		21 55
26″×26″		23 20
28″	3″	5 83
28″	4″	6 67
28″	5″	7 51
28″	6″	8 35
28″	7″	9 18
28″	8″	10 02
28″	9″	10 86
28″×10″		11 70
28″×11″		12 53
28″×12″		13 37
28″×14″		15 05
28″×16″		16 72
28″×18″		18 40
28″×20″		20 07
28″×22″		21 75
28″×24″		23 42
28″×26″		25 10
30″	3″	6 45
30″	4″	7 25
30″	5″	$8 12
30″	6″	9 00
30″	7″	9 87
30″	8″	10 75
30″	9″	11 62
30″×10″		12 50
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30″×16″		17 75
30″×18″		19 50
30″×20″		21 25
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30″×26″		26 50
32″	3″	7 08
32″	4″	8 08
32″	5″	9 08
32″	6″	11 33
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36″	3″	8 67
36″	4″	9 80
36″	5″	10 92
36″	6″	12 05
36″	7″	13 17
36″	8″	14 30
36″	9″	15 42
36″×10″		16 55
36″×11″		17 67
36″×12″		18 80
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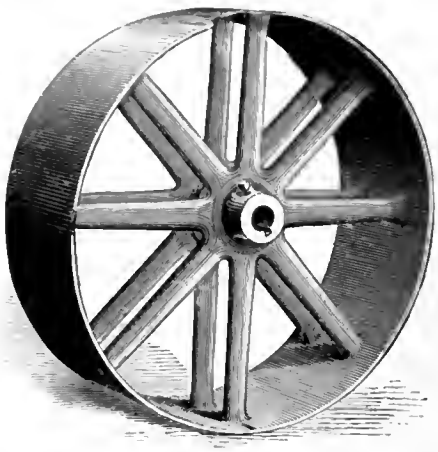
36″×20″		27 80
36″×22″		30 05
36″×24″		32 30
36″×26″		34 55
36″×28″		36 80
36″×30″		39 05
38″	3″	9 86
38″	4″	11 01
38″	5″	12 28
38″	6″	13 43
38″	7″	14 58
38″	8″	15 73

Diam. × Face.	Price.	Diam. × Face.	Price.	Diam. × Face.	Price.	Diam. × Face.	Price.	Diam. × Face.	Price.
38″× 9″	$16 88	44″×24″	$50 46	52″×11″	$35 37	58″×32″	$93 51	66″×16″	$67 93
38″×10″	18 03	44″×26″	54 11	52″×12″	37 75	58″×34″	98 51	66″×18″	74 48
38″×11″	19 18	44″×28″	57 76	52″×14″	42 50	60″× 6″	30 30	66″×20″	80 78
38″×12″	20 33	44″×30″	61 41	52″×16″	47 25	60″× 7″	32 81	66″×22″	87 33
38″×14″	22 63	46″× 4″	15 15	52″×18″	52 00	60″× 8″	35 32	66″×24″	93 88
38″×16″	24 93	46″× 5″	17 15	52″×20″	56 75	60″× 9″	37 83	66″×26″	100 43
38″×18″	25 98	46″× 6″	19 15	52″×22″	61 50	60″×10″	40 35	66″×28″	106 98
38″×20″	28 28	46″× 7″	21 15	52″×24″	66 25	60″×11″	42 86	66″×30″	113 53
38″×22″	30 58	46″× 8″	23 15	52″×26″	71 00	60″×12″	45 37	66″×32″	120 08
38″×24″	32 88	46″× 9″	25 15	52″×28″	75 75	60″×14″	50 40	66″×34″	126 63
38″×26″	35 18	46″×10″	27 15	52″×30″	80 50	60″×16″	55 42	68″× 6″	36 93
38″×28″	37 48	46″×11″	29 15	52″×32″	85 25	60″×18″	60 45	68″× 7″	40 36
38″×30″	41 03	46″×12″	31 15	54″× 5″	22 92	60″×20″	65 47	68″× 8″	43 78
40″× 3″	11 78	46″×14″	35 15	54″× 6″	25 30	60″×22″	70 50	68″× 9″	47 21
40″× 4″	13 03	46″×16″	39 15	54″× 7″	27 67	60″×24″	75 52	68″×10″	50 63
40″× 5″	14 28	46″×18″	43 15	54″× 8″	29 92	60″×26″	80 55	68″×11″	54 06
40″× 6″	15 53	46″×20″	47 15	54″× 9″	32 30	60″×28″	85 57	68″×12″	57 48
40″× 7″	16 78	46″×22″	51 15	54″×10″	34 67	60″×30″	90 60	68″×14″	64 33
40″× 8″	18 03	46″×24″	55 15	54″×11″	37 05	60″×32″	95 62	68″×16″	71 18
40″× 9″	19 28	46″×26″	59 15	54″×12″	39 42	60″×34″	100 65	68″×18″	78 03
40″×10″	20 53	46″×28″	63 15	54″×14″	44 17	62″× 6″	31 87	68″×20″	84 88
40″×11″	21 78	46″×30″	67 15	54″×16″	48 92	62″× 7″	34 37	68″×22″	91 73
40″×12″	23 03	48″× 4″	16 50	54″×18″	53 67	62″× 8″	37 37	68″×24″	98 58
40″×14″	25 53	48″× 5″	18 62	54″×20″	58 42	62″× 9″	40 12	68″×26″	105 43
40″×16″	28 03	48″× 6″	20 75	54″×22″	63 17	62″×10″	43 12	68″×28″	112 28
40″×18″	30 53	48″× 7″	22 87	54″×24″	67 92	62″×11″	45 62	68″×30″	119 13
40″×20″	33 03	48″× 8″	25 00	54″×26″	72 67	62″×12″	48 37	68″×32″	125 98
40″×22″	35 53	48″× 9″	27 12	54″×28″	77 42	62″×14″	53 87	68″×34″	132 83
40″×24″	38 03	48″×10″	29 25	54″×30″	82 17	62″×16″	59 37	70″× 6″	38 81
40″×26″	40 53	48″×11″	31 37	54″×32″	86 92	62″×18″	64 87	70″× 7″	42 42
40″×28″	43 10	48″×12″	33 50	56″× 6″	26 81	62″×20″	70 37	70″× 8″	46 03
40″×30″	45 53	48″×14″	37 75	56″× 7″	29 26	62″×22″	75 87	70″× 9″	49 65
42″× 4″	12 82	48″×16″	42 00	56″× 8″	31 71	62″×24″	81 37	70″×10″	53 26
42″× 5″	14 52	48″×18″	46 25	56″× 9″	34 16	62″×26″	86 87	70″×11″	56 87
42″× 6″	16 22	48″×20″	50 50	56″×10″	36 61	62″×28″	92 37	70″×12″	60 48
42″× 7″	17 92	48″×22″	54 75	56″×11″	39 06	62″×30″	97 87	70″×14″	67 71
42″× 8″	19 62	48″×24″	59 00	56″×12″	41 51	62″×32″	103 37	70″×16″	74 93
42″× 9″	21 32	48″×26″	63 25	56″×14″	46 41	62″×34″	108 87	70″×18″	82 16
42″×10″	23 02	48″×28″	67 50	56″×16″	51 31	64″× 6″	33 45	70″×20″	89 38
42″×11″	24 72	48″×30″	71 75	56″×18″	56 21	64″× 7″	36 46	70″×22″	96 61
42″×12″	26 42	50″× 5″	19 68	56″×20″	61 11	64″× 8″	39 47	70″×24″	103 83
42″×14″	29 82	50″× 6″	21 93	56″×22″	66 01	64″× 9″	42 48	70″×26″	111 06
42″×16″	33 22	50″× 7″	24 18	56″×24″	70 91	64″×10″	45 50	70″×28″	118 28
42″×18″	36 62	50″× 8″	26 43	56″×26″	75 81	64″×11″	48 51	70″×30″	125 51
42″×20″	40 02	50″× 9″	28 68	56″×28″	80 71	64″×12″	51 52	70″×32″	132 73
42″×22″	43 42	50″×10″	30 93	56″×30″	85 61	64″×14″	57 55	70″×34″	138 71
42″×24″	46 82	50″×11″	33 18	56″×32″	90 51	64″×16″	63 57	72″× 6″	40 68
42″×26″	50 22	50″×12″	35 43	56″×34″	95 41	64″×18″	69 60	72″× 7″	44 43
42″×28″	53 62	50″×14″	39 93	58″× 6″	28 51	64″×20″	75 62	72″× 8″	48 18
42″×30″	57 02	50″×16″	44 43	58″× 7″	31 01	64″×22″	81 65	72″× 9″	51 93
42″×32″	60 42	50″×18″	48 93	58″× 8″	33 51	64″×24″	87 67	72″×10″	55 68
44″× 4″	13 96	50″×20″	53 43	58″× 9″	36 01	64″×26″	93 70	72″×11″	59 43
44″× 5″	15 78	50″×22″	57 93	58″×10″	38 51	64″×28″	99 72	72″×12″	63 18
44″× 6″	17 61	50″×24″	62 43	58″×11″	41 01	64″×30″	105 75	72″×14″	70 68
44″× 7″	19 43	50″×26″	66 93	58″×12″	43 51	64″×32″	111 77	72″×16″	78 18
44″× 8″	21 26	50″×28″	71 43	58″×14″	48 51	64″×34″	117 80	72″×18″	85 68
44″× 9″	23 08	50″×30″	75 93	58″×16″	53 51	66″× 6″	35 06	72″×20″	93 48
44″×10″	24 91	50″×32″	80 43	58″×18″	58 51	66″× 7″	38 33	72″×22″	100 68
44″×11″	26 73	52″× 5″	21 12	58″×20″	63 51	66″× 8″	41 61	72″×24″	108 18
44″×12″	28 56	52″× 6″	23 50	58″×22″	68 51	66″× 9″	44 88	72″×26″	113 18
44″×14″	32 21	52″× 7″	25 87	58″×24″	73 51	66″×10″	48 16	72″×28″	120 68
44″×16″	35 86	52″× 8″	28 25	58″×26″	78 51	66″×11″	51 43	72″×30″	128 18
44″×18″	39 51	52″× 9″	30 62	58″×28″	83 51	66″×12″	54 83	72″×32″	135 68
44″×20″	43 16	52″×10″	33 00	58″×30″	88 51	66″×14″	61 38	72″×34″	143 18
44″×22″	46 81								



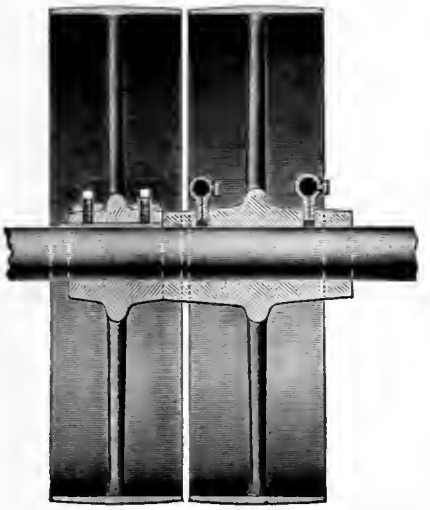
Patent Balanced Double Arm Pulleys.

Cable Word, PANLO.

Our Patent Balanced Double Arm Pulleys are well proportioned and accurately finished. They are not clumsy, as is the case with most pulleys of this kind. We guarantee them to run true and in perfect balance. In ordering, give the diameter first; next, the width of face and size of hole, as follows: 56″×21″×3$\frac{15}{16}$″. If keyway of any special size is required, give the width and depth. Set-screws are always placed opposite the key unless otherwise specified.

Diam. Face.	Price.	Diam. Face.	Price.	Diam. Face.	Price.	Diam. Face.	Price.	Diam. Face.	Price.
20″×20″	$14 37	28″×20″	$22 67	40″×20″	$35 24	52″×20″	$60 53	64″×20″	$80 66
20″×22″	15 92	28″×22″	25 15	40″×22″	37 90	52″×22″	65 60	64″×22″	87 09
20″×24″	17 60	28″×24″	27 55	40″×24″	40 56	52″×24″	70 66	64″×24″	93 52
20″×26″	19 30	28″×26″	30 00	40″×26″	43 22	52″×26″	75 73	64″×26″	98 94
20″×28″	21 70	28″×28″	32 50	40″×28″	45 88	52″×28″	80 80	64″×28″	106 37
20″×30″	23 55	28″×30″	35 02	40″×30″	48 54	52″×30″	85 86	64″×30″	112 80
21″×20″	15 32	30″×20″	24 87	42″×20″	42 69	54″×20″	62 32	66″×20″	86 17
21″×22″	17 02	30″×22″	27 47	42″×22″	46 61	54″×22″	67 38	66″×22″	93 16
21″×24″	18 80	30″×24″	30 12	42″×24″	50 18	54″×24″	72 41	66″×24″	100 14
21″×26″	20 57	30″×26″	32 72	42″×26″	53 57	54″×26″	77 48	66″×26″	107 13
21″×28″	22 47	30″×28″	35 35	42″×28″	57 20	54″×28″	82 58	66″×28″	114 12
21″×30″	24 52	30″×30″	38 00	42″×30″	60 82	54″×30″	87 65	66″×30″	121 10
22″×20″	16 27	32″×20″	27 25	44″×20″	46 04	56″×20″	65 18	68″×20″	90 54
22″×22″	18 12	32″×22″	29 90	44″×22″	49 93	56″×22″	70 41	68″×22″	97 85
22″×24″	20 00	32″×24″	32 67	44″×24″	53 85	56″×24″	75 64	68″×24″	105 16
22″×26″	21 92	32″×26″	35 45	44″×26″	57 72	56″×26″	80 86	68″×26″	112 46
22″×28″	23 92	32″×28″	38 32	44″×28″	61 61	56″×28″	86 09	68″×28″	119 77
22″×30″	26 00	32″×30″	40 77	44″×30″	65 50	56″×30″	91 32	68″×30″	127 08
23″×20″	17 22	34″×20″	28 80	46″×20″	50 29	58″×20″	67 74	70″×20″	95 34
23″×22″	19 22	34″×22″	31 20	46″×22″	54 56	58″×22″	73 08	70″×22″	103 05
23″×24″	21 22	34″×24″	33 60	46″×24″	58 82	58″×24″	78 41	70″×24″	110 76
23″×26″	23 22	34″×26″	36 00	46″×26″	63 09	58″×26″	83 74	70″×26″	118 46
23″×28″	25 22	34″×28″	38 40	46″×28″	67 36	58″×28″	89 08	70″×28″	126 17
23″×30″	27 22	34″×30″	40 40	46″×30″	71 62	58″×30″	94 41	70″×30″	133 88
24″×20″	18 22	36″×20″	29 65	48″×20″	53 86	60″×20″	69 84	72″×20″	99 40
24″×22″	20 22	36″×22″	32 05	48″×22″	58 40	60″×22″	75 20	72″×22″	107 40
24″×24″	22 22	36″×24″	34 45	48″×24″	62 95	60″×24″	80 56	72″×24″	115 14
24″×26″	24 22	36″×26″	36 85	48″×26″	67 46	60″×26″	85 92	72″×26″	120 73
24″×28″	26 22	36″×28″	39 25	48″×28″	72 00	60″×28″	91 28	72″×28″	128 73
24″×30″	28 22	36″×30″	41 65	48″×30″	76 53	60″×30″	96 64	72″×30″	136 73
26″×20″	20 42	38″×20″	30 17	50″×20″	59 00	62″×20″	75 06		
26″×22″	22 85	38″×22″	32 63	50″×22″	61 80	62″×22″	80 93		
26″×24″	25 00	38″×24″	35 08	50″×24″	66 60	62″×24″	86 80		
26″×26″	27 25	38″×26″	37 53	50″×26″	71 40	62″×26″	92 66		
26″×28″	29 62	38″×28″	39 98	50″×28″	76 20	62″×28″	98 53		
26″×30″	31 92	38″×30″	42 43	50″×30″	81 00	62″×30″	104 40		

Tight and Loose Pulleys.



Additional Price

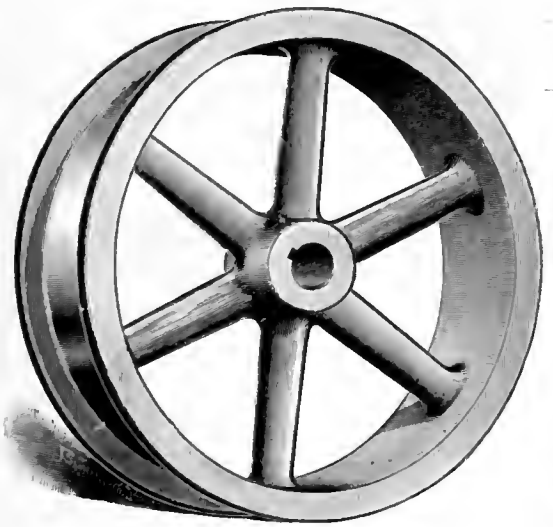
To be added to List Price, per Pair, for

Tight and Loose Pulleys.

Cable Word, PEST.

Diameter in Inches.	Price.	Diameter in Inches.	Price.
6 to 8	$0 80	25 to 26	$2 40
8 to 10	1 00	27 to 28	2 55
10 to 12	1 15	29 to 30	2 75
12 to 14	1 35	31 to 32	2 90
14 to 16	1 50	33 to 34	3 10
16 to 18	1 65	35 to 36	3 25
19 to 20	1 85	37 to 40	3 60
21 to 22	2 05	41 to 44	3 95
23 to 24	2 20	45 to 48	4 30

Flange Pulleys.



Additional Price

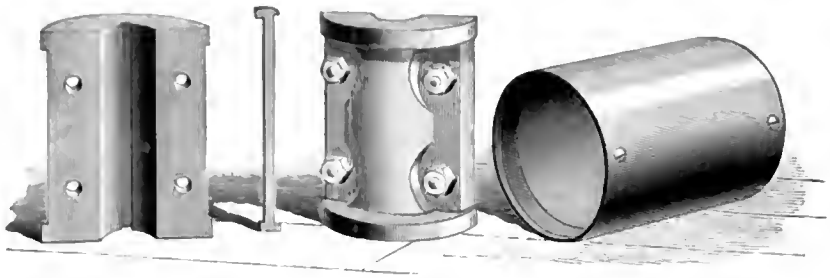
To be added to List Price for Finished

Flange Pulleys.

Cable Word, PLANO.

Diameter in Inches.	Price.	Diameter in Inches.	Price.
6 to 8	$2 35	49 to 52	$16 50
8½ to 10	2 60	53 to 56	18 15
10⅓ to 12	2 90	57 to 60	20 35
12½ to 14	3 15	61 to 66	23 10
14½ to 16	3 60	67 to 72	25 85
16½ to 18	4 00	73 to 78	28 60
19 to 20	4 40	79 to 84	31 35
21 to 22	4 95	85 to 90	34 10
23 to 24	5 50	91 to 96	36 85
25 to 26	6 05	97 to 102	39 85
27 to 28	6 90	103 to 108	42 90
29 to 30	7 70	109 to 114	45 65
31 to 32	8 55	115 to 120	48 40
33 to 34	9 35	121 to 126	51 15
35 to 36	10 20	127 to 132	53 90
37 to 40	11 55	133 to 138	56 90
41 to 44	13 20	139 to 144	59 90
45 to 48	14 85		

Pulleys with one Flange only, one-half that given above. Pulleys with three Flanges, one-half more than given above.

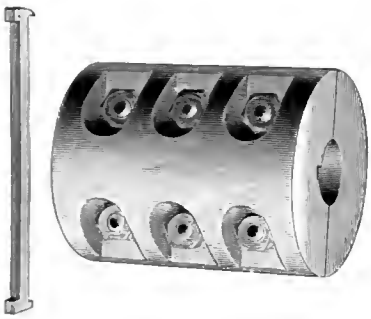


No. 1 Compression Coupling with Sleeve.

Cable Word, CZARIAN.

These Couplings are made upon the same general principle as our Standard Compression Couplings, having the feather fitted accurately into its seat so that it can be inserted or removed with the fingers. The entire Coupling can be placed upon or removed from the shaft without the aid of a hammer. They are nicely fitted throughout; the sleeve is bored out and turned true on the outside, giving the Coupling, when placed together on the shaft, the appearance of a pulley; in fact, they are used as pulleys when their location and size are suitable.

Size.	Price.
$1\frac{3}{16}$″	$3 24
$1\frac{7}{16}$″	3 36
$1\frac{11}{16}$″	3 96
$1\frac{15}{16}$″	4 98
$2\frac{3}{16}$″	6 06
$2\frac{7}{16}$″	7 20
$2\frac{11}{16}$″	8 76
$2\frac{15}{16}$″	10 50
$3\frac{3}{16}$″	12 36
$3\frac{7}{16}$″	14 46
$3\frac{11}{16}$″	16 80
$3\frac{15}{16}$″	19 20
$4\frac{7}{16}$″	25 50
$4\frac{15}{16}$″	32 04
$5\frac{7}{16}$″	42 00
$5\frac{15}{16}$″	52 00



No. 2 Standard Compression Coupling.

Cable Word, CZAR.

This engraving represents our Improved Standard Compression Coupling, used for connecting shafts together. They can be easily placed in position on the shafts, as the feather is not driven into the seat as with ordinary couplings, but neatly fitted therein so that it can be slipped in by hand; the holes are accurately bored and reamed and when the six bolts are drawn up the shafts and coupling will run perfectly true. These Couplings are accurately turned and faced off on the ends, and they are recommended as the only first-class and substantial Couplings on the market.

Size.	Price Fitted.
$1\frac{3}{16}$″	$2 92
$1\frac{7}{16}$″	3 03
$1\frac{11}{16}$″	3 57
$1\frac{15}{16}$″	4 49
$2\frac{3}{16}$″	5 46
$2\frac{7}{16}$″	6 48
$2\frac{11}{16}$″	7 89
$2\frac{15}{16}$″	9 45
$3\frac{3}{16}$″	11 13
$3\frac{7}{16}$″	13 02
$3\frac{11}{16}$″	15 12
$3\frac{15}{16}$″	17 28
$4\frac{7}{16}$″	22 95
$4\frac{11}{16}$″	28 84
$5\frac{7}{16}$″	37 80
$5\frac{11}{16}$″	46 80

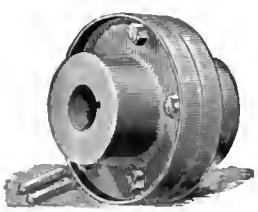


Plate or Flange Couplings.

Cable Word, COLLIE.

Diameter of Shaft.	Price of One Pair.	Price for Fitting One Pair to Shaft.	Diameter of Shaft.	Price of One Pair.	Price for Fitting One Pair to Shaft.
$1\frac{7}{16}$″	$4 00	$1 25	$4\frac{7}{16}$″	$25 62	$6 50
$1\frac{11}{16}$″	4 25	1 25	$4\frac{15}{16}$″	32 50	9 00
$1\frac{15}{16}$″	4 50	1 38	$5\frac{7}{16}$″	40 00	10 00
$2\frac{3}{16}$″	5 25	1 38	$5\frac{15}{16}$″	47 50	11 00
$2\frac{7}{16}$″	6 25	1 50	$6\frac{7}{16}$″	50 00	12 25
$2\frac{11}{16}$″	7 50	1 63	$6\frac{15}{16}$″	52 50	13 25
$2\frac{15}{16}$″	9 25	1 75	$7\frac{7}{16}$″	63 00	14 25
$3\frac{3}{16}$″	11 00	2 00	$7\frac{15}{16}$″	71 00	15 00
$3\frac{7}{16}$″	12 50	2 25	$8\frac{7}{16}$″	80 00	16 25
$3\frac{11}{16}$″	14 50	2 50	$8\frac{15}{16}$″	90 00	17 50
$3\frac{15}{16}$″	16 25	3 00	$9\frac{7}{16}$″	100 00	18 75

Turned Finished Shafting.

Cable Word, SANO.

We desire to call special attention to the quality of our Turned Shafting. It is all made from Bessemer steel, which is strong and tough. It is turned true to standard gauges in a special hollow spindle lathe invented by us, and after it is finished it is straightened upon friction rolls and made to run perfectly true. Each length is highly polished, including the ends, which are free from center marks. Our standard lengths are 20-foot, although special long or short lengths are furnished when so ordered. When two shafts of different diameters are to be coupled together, we weld a stub end to the smaller one, of the same diameter as the larger shaft, thus enabling a coupling of equal size to be used, and making a much stronger job than by the old method.

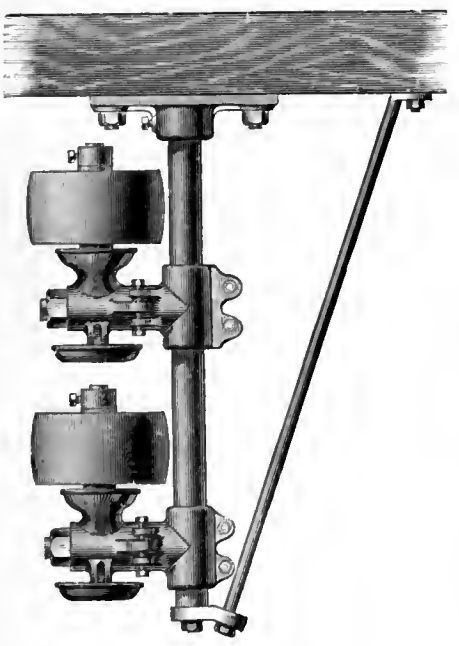
Diameter.	Price.
1 3/16"	$0 45
1 7/16"	52
1 11/16"	60
1 15/16"	71
2 3/16"	82
2 7/16"	1 05
2 11/16"	1 23
2 15/16"	1 42
3 3/16"	1 68
3 7/16"	1 81
3 11/16"	2 25
3 15/16"	2 70

Diameter.	Price.
4 7/16"	$3 56
4 15/16"	4 61
5 7/16"	6 56
5 15/16"	8 51
6 7/16"	9 90
6 15/16"	11 92
7 7/16"	14 17
7 15/16"	16 68
8 7/16"	20 50
8 15/16"	22 50
9 7/16"	25 90

Collars With Blind Set-Screws.

Cable Word, CUVOS.

Size.	Price.	Size.	Price.	Size.	Price.
1 3/16"	$0 38	3 3/16"	$1 63	6 7/16"	$5 08
1 7/16"	50	3 7/16"	1 88	6 15/16"	5 95
1 11/16"	63	3 11/16"	2 03	7 7/16"	6 90
1 15/16"	75	3 15/16"	2 20	7 15/16"	7 95
2 3/16"	94	4 7/16"	2 25	8 7/16"	9 08
2 7/16"	1 08	4 15/16"	3 25	8 15/16"	10 20
2 11/16"	1 25	5 7/16"	3 63	9 7/16"	11 40
2 15/16"	1 48	5 15/16"	4 63		



Mule Pulley Stand.

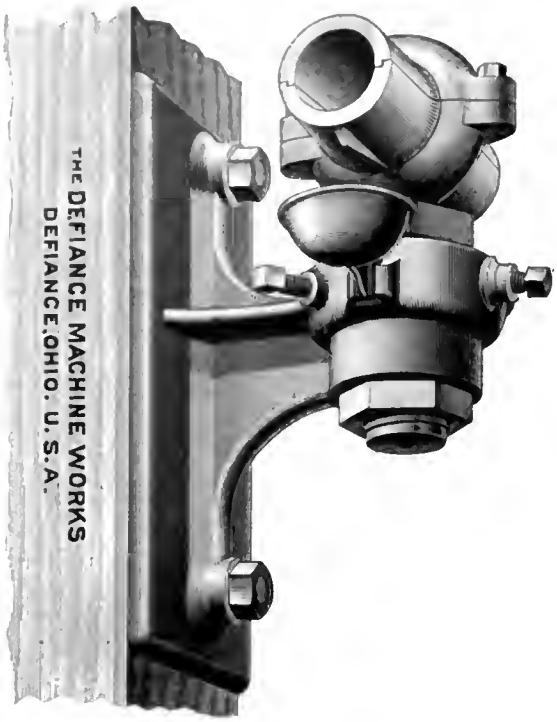
Cable Word, MAUDY.

For Carrying Power Around a Corner. Adjustable in Every Direction.

The line shafts may be at any angle with each other, may not be in the same plane, the pulleys may differ much in diameter, and the belt may be crossed.

Locate the stand so that its shaft will be about ten times the width of the belt from the line shafts.

No. 1.	For 3 to 5 inch Single Belt	$40 00
No. 2.	For 6 to 9 inch Single Belt	50 00
No. 3.	For 10 to 12 inch Single Belt	75 00
No. 4.	For 13 to 15 inch Single Belt	90 00
No. 5.	For 16 to 20 inch Single Belt	130 00



Nos. 6, 7 and 8

Ball and Socket Adjustable Post Hangers,

With Self-Lubricating Boxes.

This engraving represents the only perfect Ball and Socket Adjustable Post Hanger in the market. It is simple and adjustable in every direction. The Stem forms a jack-screw, having heavy hexagon nuts at top and bottom for vertical adjustment. The center of the box is fitted with a large Self-oiling Chamber, and at each end with Removable Drip Cups. By the use of these Hangers a line shaft can be kept in perfect alignment with no expense.

Length of Box, Four Times the Diameter of Shaft.

Number.	Size of Box.	Distance from Post to Center.	Price Each.
6	$2\frac{3}{16}$″	8½″	$9 65
6	$2\frac{7}{16}$″	8½″	11 00
6	$2\frac{11}{16}$″	8½″	12 35
6	$2\frac{15}{16}$″	8½″	13 65
7	$2\frac{1}{16}$″	10¼″	17 30
7	$3\frac{7}{16}$″	10¼″	18 90
8	$3\frac{7}{16}$″	10 ″	18 90
8	$3\frac{15}{16}$″	10 ″	21 65

No. 4

Ball and Socket Adjustable Post Hanger,

With Self-Lubricating Boxes.

This engraving represents our No. 4 Post Hanger, which is somewhat lower in price than the Nos. 6, 7, and 8, although it is a good strong Hanger, with Ball and Socket Box, with Self-oiling Chamber, and very conveniently arranged for placing the shaft in or removing it.

Length of Box, Four Times the Diameter of Shaft.

Number.	Size of Box.	Distance from Post to Center of Box.	Price Each.
4	$2\frac{3}{16}$″	5 or 7½ as desired.	$6 65
4	$2\frac{7}{16}$″	5 or 7½ as desired.	9 35
4	$2\frac{11}{16}$″	5 or 7½ as desired.	12 00
4	$2\frac{15}{16}$″	5 or 7½ as desired.	14 65

No. 5

Adjustable Ball and Socket Post Hanger,

With Self-Lubricating Boxes.

Number.	Size of Box.	Distance from Post to Center of Box.	Price Each.
5	$2\frac{3}{16}$″	$6\frac{1}{2}$″	$9 65
5	$2\frac{7}{16}$″	$6\frac{1}{2}$″	11 00
5	$2\frac{11}{16}$″	$6\frac{1}{2}$″	12 35
5	$2\frac{15}{16}$″	$6\frac{1}{2}$″	13 65

This No. 5 Ball and Socket Adjustable Post Hanger can be adjusted in every direction for lining up the shaft, the stem forming a 3″ jack-screw. It is fitted with a large Self-lubricating Oil Chamber, and Removable Drip Cups at each end. It is by far the simplest and most substantial Hanger in the market. For beauty of design, ease of adjustment, and good workmanship, we challenge the world.

Length of Box, Four Times the Diameter of Shaft.

Nos. 1 and 2

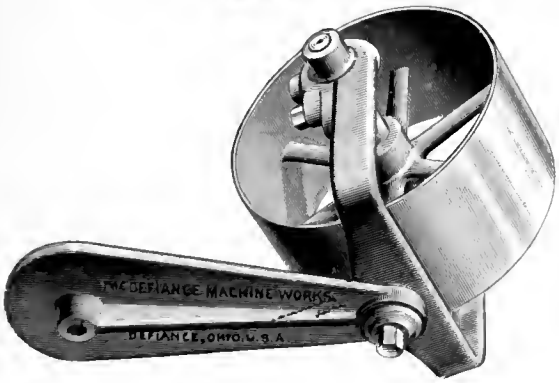
Ball and Socket Adjustable Post Hangers,

With Self-Oiling Boxes.

Number.	Size of Box.	Distance from Post to Center of Box.	Price Each.
1	$1\frac{7}{16}$″	$7\frac{1}{2}$″	$5 65
1	$1\frac{11}{16}$″	$7\frac{1}{2}$″	6 00
1	$1\frac{15}{16}$″	$7\frac{1}{2}$″	6 35
1	$2\frac{3}{16}$″	$7\frac{1}{2}$″	6 65
2	$1\frac{7}{16}$″	$8\frac{1}{2}$″	6 00
2	$1\frac{11}{16}$″	$8\frac{1}{2}$″	6 35
2	$1\frac{15}{16}$″	$8\frac{1}{2}$″	6 65
2	$2\frac{3}{16}$″	$8\frac{1}{2}$″	7 00

The above Nos. 1 and 2 Ball and Socket Adjustable Post Hangers can be adjusted in every direction, and they are fitted with Self-oiling Chambers, and Drip Cups at both ends. With them a shaft can be kept in perfect alignment without expense. They are indispensable when a true running shaft is desired.

Length of Box, Four Times the Diameter of Shaft.

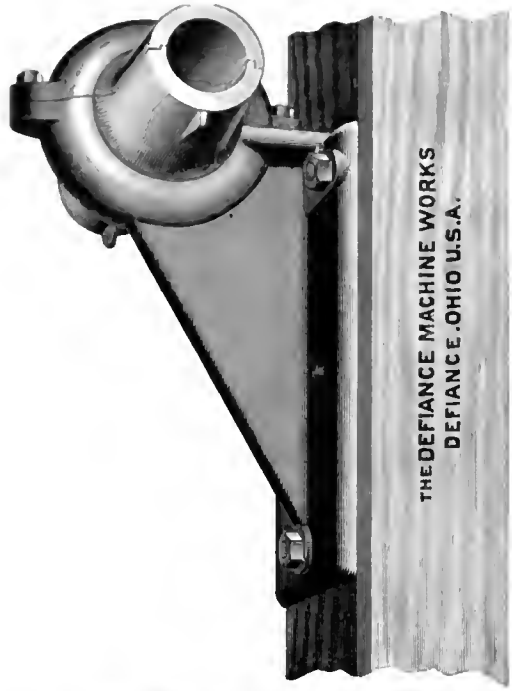


Adjustable Belt Tightener.

Cable Word, TIDE.

Size as shown by Engraving, Pulley 10″×8″, Price, $9.00.

The above Tighteners are furnished in other sizes, prices for which will be quoted upon application.



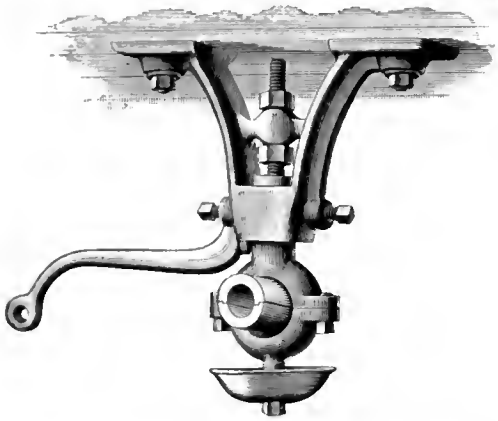
Improved Ball and Socket Bracket Boxes,

With Self-Oiling Chambers.

These Ball and Socket Bracket Boxes have Self-oiling Chambers. They are nicely made, and can be adjusted up or down by loosening the screws which hold them to the post; the holes in the body of the Brackets are long for this purpose. For a cheap box they have no equal.

Length of Box. Four Times the Diameter of Shaft.

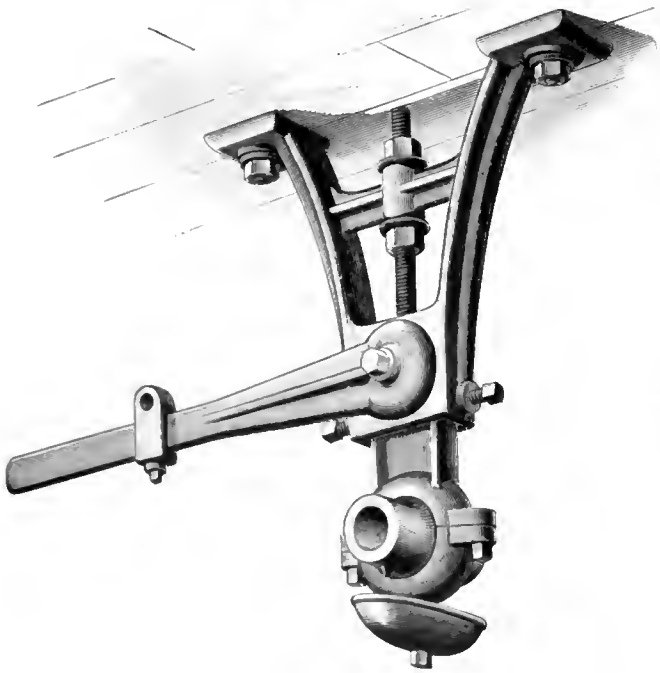
Size of Box.	Price Each.	Size of Box.	Price Each.
1 3/16"	$2 10	3 3/16"	$10 40
1 7/16"	2 60	3 7/16"	12 80
1 11/16"	2 80	3 11/16"	14 80
1 15/16"	3 35	3 15/16"	16 80
2 3/16"	4 10	4 7/16"	24 00
2 7/16"	5 60	4 11/16"	28 00
2 11/16"	6 40	4 15/16"	33 50
2 15/16"	8 00		



Nos. 1 and 0

Ball and Socket Adjustable Drop Hangers.

Number.	Size of Box.	Amount of Drop.	Weight.	Price Each.
1	1 3/16"	13"	33 lbs.	$3 65
1	1 7/16"	13"	34 lbs.	3 90
1	1 7/16"	13"	35 lbs.	4 25
1	1 9/16"	13"	36 lbs.	5 05
1	1 11/16"	13"	37 lbs.	5 20
0	15/16"	8"	16 lbs.	2 65
0	1 1/16"	8"	17 lbs.	3 00
0	1 3/16"	8"	18 lbs.	3 35
0	1 5/16"	8"	20 lbs.	3 55



No. 2

Ball and Socket Adjustable Drop Hangers,

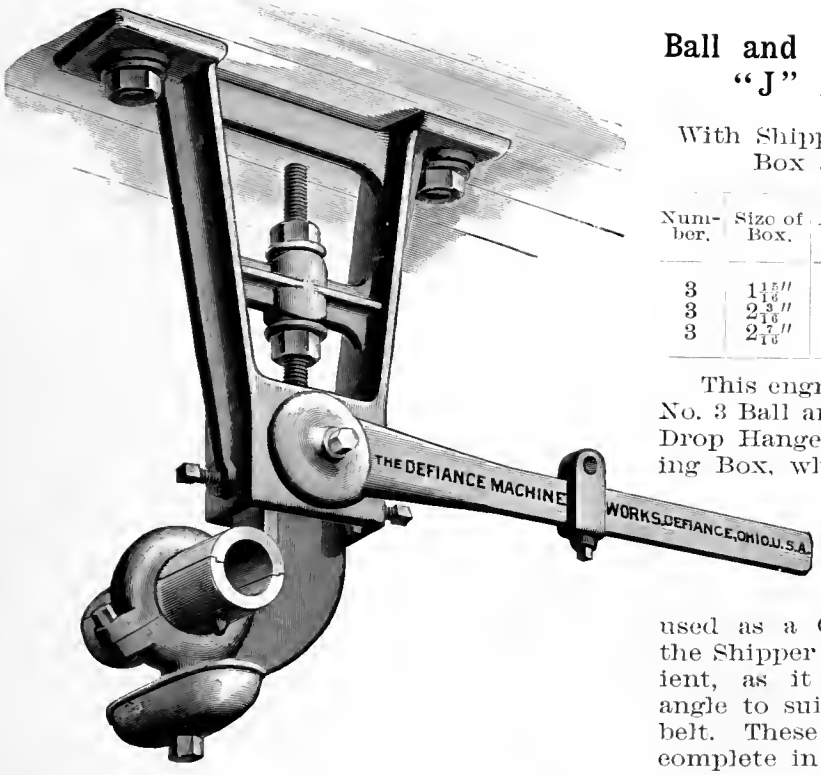
With Self-Oiling Boxes.

Number.	Size of Box.	Amount of Drop.	Price Each.
2	1 7/16"	14"	$5 10
2	1 9/16"	14"	5 85
2	1 11/16"	14"	6 60
2	1 15/16"	14"	7 35
2	2 3/16"	14"	8 10

This No. 2 Hanger is also furnished with a J Drop, at the following prices:

Net Price List 14" and 20" No. 2 J Drop Hangers.

Number.	Size of Box.	Amount of Drop.	Price Each.
2	1 7/16"	14"	$5 10
2	1 9/16"	14"	5 85
2	1 11/16"	14"	6 60
2	1 15/16"	14"	7 35
2	2 3/16"	14"	8 10
2	1 7/16"	20"	5 85
2	1 9/16"	20"	6 45
2	1 11/16"	20"	6 60
2	1 15/16"	20"	7 95
2	2 3/16"	20"	8 85



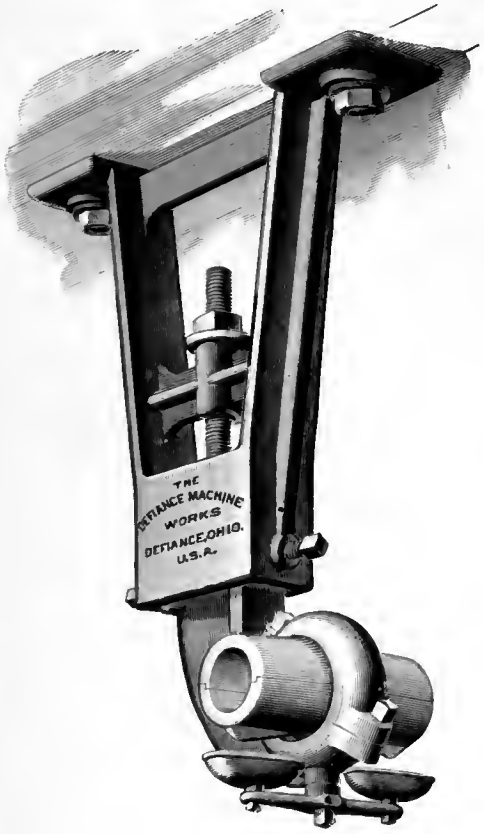
No. 3

Ball and Socket Adjustable "J" Drop Hanger,

With Shipper Arm, Self-Oiling Box and Drip Cup.

Number.	Size of Box.	Amount of Drop.	Weight.	Price Each.
3	$1\frac{15}{16}$″	27″	135 lbs.	$12 15
3	$2\frac{3}{16}$″	27″	140 lbs.	13 50
3	$2\frac{7}{16}$″	27″	145 lbs.	14 50

This engraving represents our No. 3 Ball and Socket Adjustable Drop Hanger, with Self-lubricating Box, which can be adjusted up or down or sidewise, and it is furnished with or without the Shipper Arm. When used as a Countershaft Hanger the Shipper Arm is very convenient, as it can be set at any angle to suit the location of the belt. These Hangers are most complete in every way.



No. 4

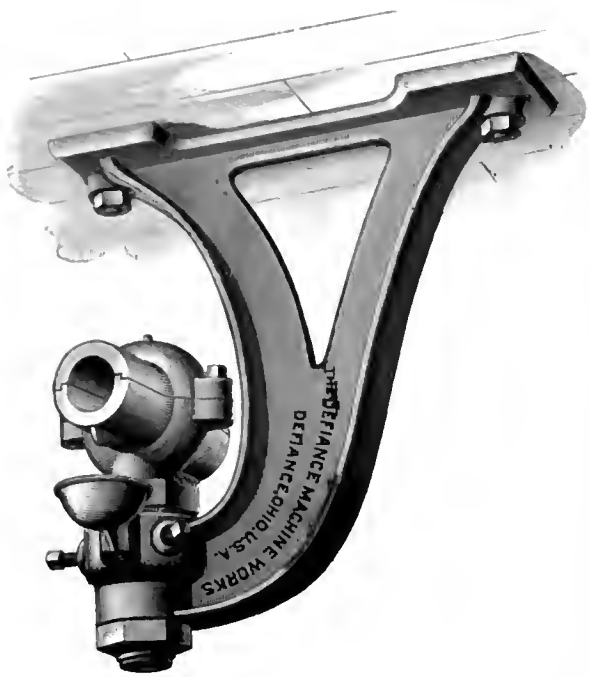
Ball and Socket Adjustable "J" Drop Hanger,

With Self-Oiling Box and Drip Cups.

Number.	Size of Box.	Amount of Drop.	Weight.	Price Each.
4	$2\frac{3}{16}$″	28″	135 lbs.	$12 50
4	$2\frac{7}{16}$″	28″	140 lbs.	13 50
4	$2\frac{11}{16}$″	28″	145 lbs.	14 50
4	$2\frac{15}{16}$″	28″	160 lbs.	15 50

These No. 4 Drop Hangers have Ball and Socket Self-oiling Boxes, fitted with Drip Cups, and are provided with vertical and side adjustments to keep the shaft in line. They are used for counters or main line shafts. The J-shaped neck makes them very convenient to place in or remove the shaft, as well as making them exeeedingly strong.

Length of Box, Four Times the Diameter of Shaft.



Nos. 6, 7 and 8

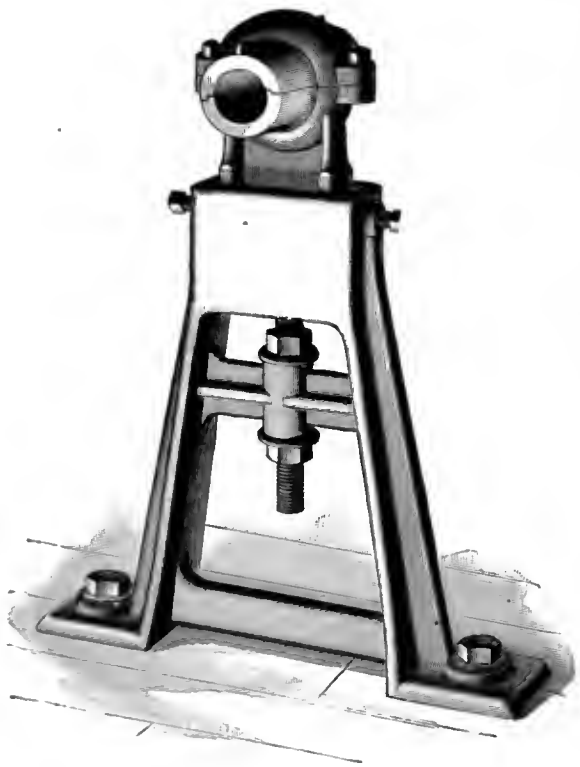
Ball and Socket Adjustable Drop Hangers,

With Self-Oiling Chambers.

Number.	Amount of Drop.	Size of Box.	Price Each.
6	14″	$2\frac{3}{16}$″	$12 95
6	14″	$2\frac{7}{16}$″	13 50
6	14″	$2\frac{11}{16}$″	13 95
6	14″	$2\frac{15}{16}$″	14 80
6	18″	$2\frac{3}{16}$″	13 75
6	18″	$2\frac{7}{16}$″	14 25
6	18″	$2\frac{11}{16}$″	14 70
6	18″	$2\frac{15}{16}$″	15 60
6	21″	$2\frac{3}{16}$″	14 50
6	21″	$2\frac{7}{16}$″	15 00
6	21″	$2\frac{11}{16}$″	15 40
6	21″	$2\frac{15}{16}$″	16 30
6	30″	$2\frac{3}{16}$″	15 30
6	30″	$2\frac{7}{16}$″	15 75
6	30″	$2\frac{11}{16}$″	16 20
6	30″	$2\frac{15}{16}$″	17 10
7	21″	$2\frac{15}{16}$″	17 25
7	21″	$3\frac{7}{16}$″	22 50
7	30″	$2\frac{15}{16}$″	20 25
7	30″	$3\frac{7}{16}$″	23 25
8	18″	$3\frac{7}{16}$″	23 25
8	18″	$3\frac{15}{16}$″	26 25
8	24″	$3\frac{7}{16}$″	26 25
8	24″	$3\frac{15}{16}$″	29 25

The Box in the above Hangers is Ball and Socket, with Self-oiling Chambers, and can be adjusted in every direction for keeping the shaft in line. These are the neatest, strongest, and best Drop Hangers in the market.

Length of Box, Four Times the Diameter of Shaft.



No. 3

Ball and Socket Adjustable Floor Stands,

With Self-Oiling Boxes.

Number.	Size of Box.	Amount of Drop.	Weight.	Price Each.
3	$1\frac{15}{16}$″	24″	125 lbs.	$11 25
3	$2\frac{3}{16}$″	24″	130 lbs.	11 70
3	$2\frac{7}{16}$″	24″	135 lbs.	12 15

Shipper Rod and Belt Shipper Fingers, $0 50

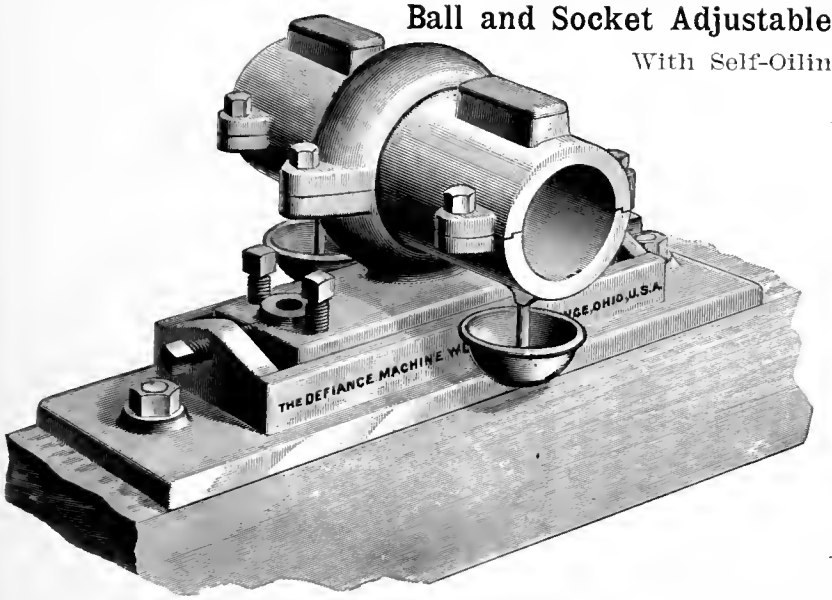
Shipper Arms, each, ... 50

These Hangers are intended more especially to stand on the floor, as shown by the engraving, to support line or countershafts. They have every desired adjustment, and are Self-oiling. They can be used, however, as Ceiling Hangers, but are not so convenient as the Nos. 3 and 4 "J" Drop Hangers, as shown on preceding pages.

Length of Box, Four Times the Diameter of Shaft.

Ball and Socket Adjustable Pedestal and Base,

With Self-Oiling Box.

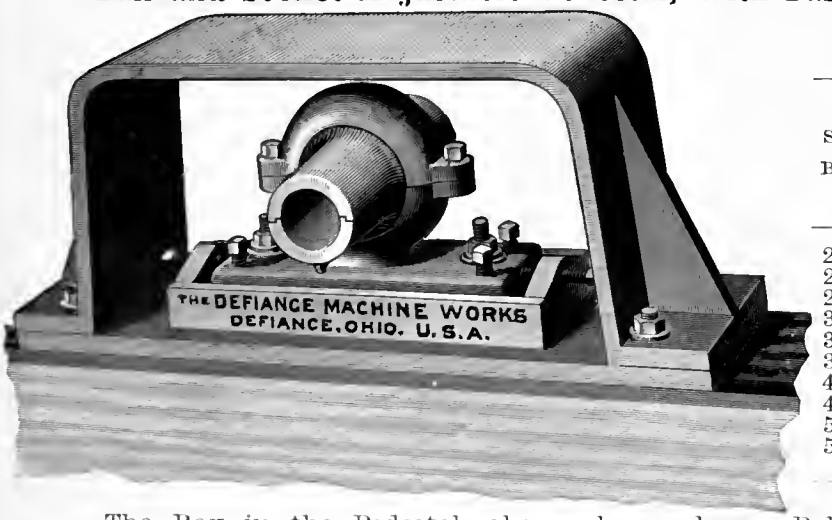


Size of Box.	Pedestal Only. Price.	Pedestal Base Only. Price.	Ball and Socket Pedestal and Base Complete. Price.
$2\frac{7}{16}$"	$7 35	$3 45	$10 80
$2\frac{11}{16}$"	9 05	4 00	13 05
$2\frac{15}{16}$"	12 00	4 65	16 65
$3\frac{3}{16}$"	14 00	6 00	20 00
$3\frac{7}{16}$"	17 00	6 10	23 10
$3\frac{11}{16}$"	23 65	7 60	31 25
$4\frac{7}{16}$"	31 65	9 05	40 70
$4\frac{15}{16}$"	41 30	10 00	51 30
$5\frac{7}{16}$"	56 65	12 00	68 65
$5\frac{15}{16}$"	72 00	14 00	86 00

These Bearings are nicely made and very strong and durable. They are furnished with babbitt metal lining, or bored out and reamed, as desired. The box is Ball and Socket, and adjustable in every direction to line up the shaft. It is Self-oiling and supplied with Drip Cups at each end. Length of Box, Four Times the Diameter of Shaft.

Ball and Socket Adjustable Pedestal, With Base and Wall Arch,

With Self-Oiling Box.

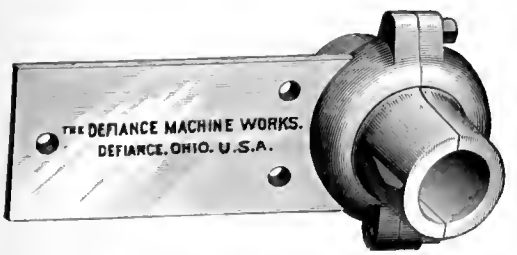


Size of Box.	Pedestal Only. Price.	Base and Arch Only. Price.	Pedestal Base and Arch Complete. Price.
$2\frac{7}{16}$"	$7 30	$7 30	$14 60
$2\frac{11}{16}$"	9 05	8 30	17 35
$2\frac{15}{16}$"	12 00	8 65	20 65
$3\frac{3}{16}$"	14 00	9 30	23 30
$3\frac{7}{16}$"	17 00	12 30	29 30
$3\frac{15}{16}$"	23 65	16 00	39 65
$4\frac{7}{16}$"	31 65	20 00	51 65
$4\frac{15}{16}$"	41 30	30 00	71 30
$5\frac{7}{16}$"	56 65	40 00	96 65
$5\frac{15}{16}$"	72 00	41 00	113 30

The Box in the Pedestal, above shown, has a Ball and Socket bearing. They are furnished with babbitt metal lining, or bored out and reamed, as desired. The entire Pedestal can be adjusted up or down, or endwise, by the screws, as shown, for lining up the Shaft. The Wall Arch is well designed and very strong. Length of Box, Four Times the Diameter of Shaft.

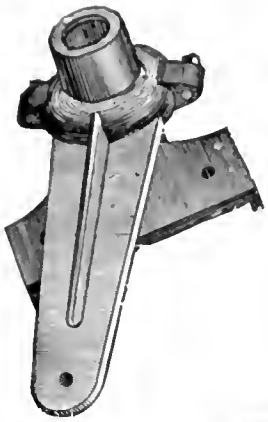
Ball and Socket Plank Box,

With Self-Oiling Bearing.



These Boxes are intended to cover a wide range of uses; are often attached to the end of frames for swing saws, belt tighteners, etc. They can be used at any angle.

Size of Box.	Price Each.	Size of Box.	Price Each.	Size of Box.	Price Each.	Size of Box.	Price Each.
$1\frac{3}{16}$"	$2 05	$1\frac{15}{16}$"	$3 30	$2\frac{11}{16}$"	$6 40	$3\frac{7}{16}$"	$12 80
$1\frac{7}{16}$"	2 60	$2\frac{3}{16}$"	4 80	$2\frac{15}{16}$"	8 00	$3\frac{11}{16}$"	14 80
$1\frac{11}{16}$"	2 80	$2\frac{7}{16}$"	5 60	$3\frac{3}{16}$"	10 40	$3\frac{15}{16}$"	16 80



Ball and Socket Lever Box,

For Engaging and Disengaging Frictional Gearing, Hauling Apparatus, Hoisting Apparatus, Etc.

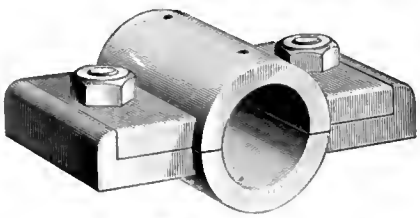
Same price as Platform Boxes below.

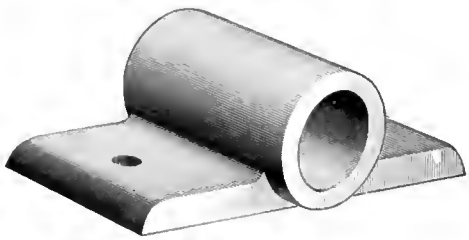
Ball and Socket Platform Boxes,

With Self-Oiling Bearings.

Size of Shaft.	Price Each.
$1\frac{3}{16}$"	$2 80
$1\frac{7}{16}$"	3 00
$1\frac{11}{16}$"	3 15
$1\frac{15}{16}$"	4 85
$2\frac{3}{16}$"	5 65
$2\frac{7}{16}$"	6 65
$2\frac{11}{16}$"	9 05
$2\frac{15}{16}$"	12 00
$3\frac{3}{16}$"	14 00
$3\frac{7}{16}$"	17 00
$3\frac{11}{16}$"	21 00
$3\frac{15}{16}$"	23 60
$4\frac{7}{16}$"	31 65
$4\frac{11}{16}$"	35 60
$4\frac{15}{16}$"	41 30
$5\frac{7}{16}$"	56 65
$5\frac{15}{16}$"	72 00

Length of Box, Four Times the Diameter of Shaft.

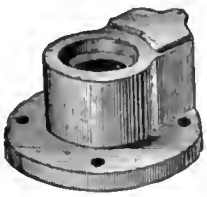




Common Flat Boxes,

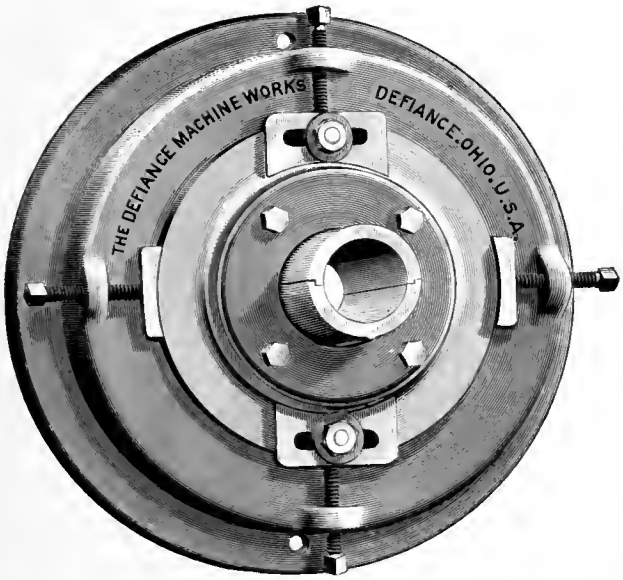
Made in Halves or Solid, Babbitted or Bored Out.

Size of Box.	Price Each.
$1\frac{3}{16}$"	$2 65
$1\frac{5}{16}$"	2 75
$1\frac{7}{16}$"	2 85
$1\frac{15}{16}$"	4 55
$2\frac{3}{16}$"	5 30
$2\frac{7}{16}$"	6 25
$2\frac{11}{16}$"	8 50
$2\frac{15}{16}$"	11 25



Bridge Pot, or Step for Upright Shaft.

Size of Shaft,	$1\frac{1}{2}$"	$1\frac{3}{4}$"	2"	$2\frac{1}{4}$"	$2\frac{1}{2}$"	$2\frac{3}{4}$"	3"	$3\frac{1}{4}$"	$3\frac{1}{2}$"
Net Price Each,	$2 25	2 65	3 00	3 40	3 75	4 10	4 50	4 85	5 25

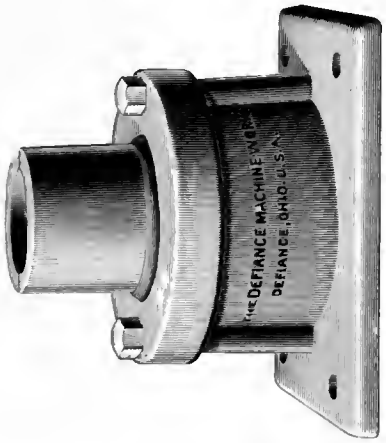


No. 1

Ball and Socket Adjustable Wall Bearing.

Size of Box.	Price Each.
$2\frac{7}{16}$"	$19 70
$2\frac{15}{16}$"	22 40
$3\frac{3}{16}$"	25 05
$3\frac{7}{16}$"	27 70

Length of Box, Four Times the Diameter of Shaft.



No. 2

Ball and Socket Wall Bearing.

Size of Box.	Price Each.
$1\frac{15}{16}$"	$6 80
$2\frac{3}{16}$"	7 00
$2\frac{7}{16}$"	10 00
$2\frac{15}{16}$"	12 65

Cut Gear Wheels.

Cable Word, GAGE.

An experience of many years in making and cutting Gear Wheels to order, the dimensions of which, in those of the same pitch, have been so varied in width and thickness of rims, arms, etc., compelled us to realize the great advantages which would result from a uniform standard of sizes. We have therefore made iron patterns uniform in style, and are now prepared, by the aid of automatic machinery, to furnish gears, singly, or in quantities to suit, at reasonable prices.

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